Heating Piping & Air Conditioning

MAY 1955

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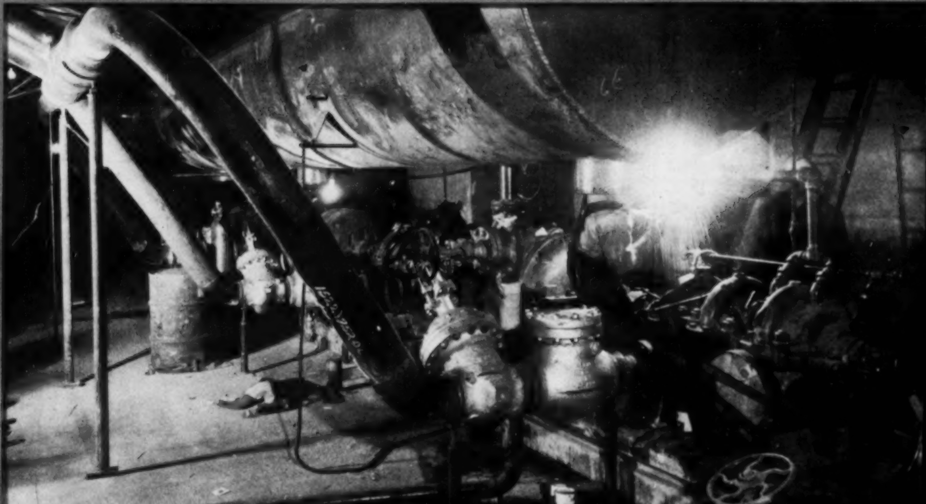

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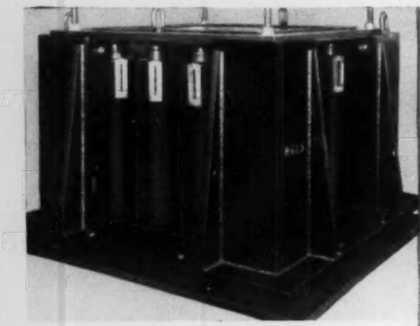
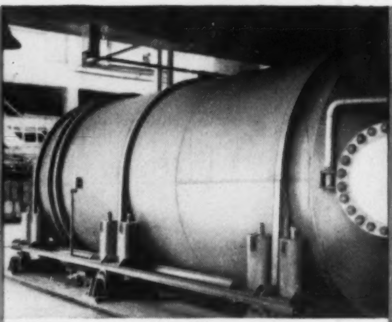
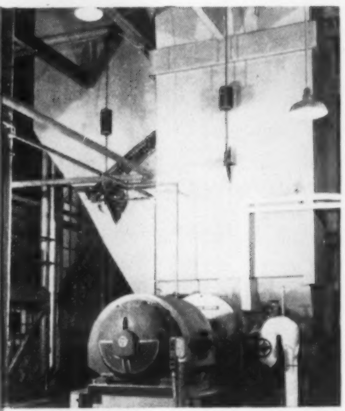


Base for supporting refinery tower, provided with Grinnell Spring Hangers for flexible support.



Grinnell Spring Hangers on large vessel of catalytic cracking unit in oil refinery.



Induced draft duct and blower in power station. Operates at about 500°F. Supported by Grinnell Spring Hangers.

To support loads that won't stand still . . .

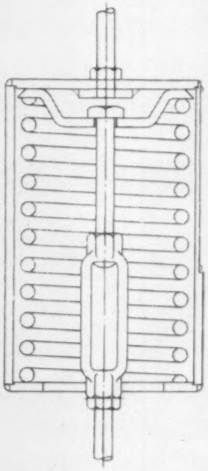
GRINNELL PRE-ENGINEERED SPRING HANGERS

There are many industrial installations where heavy loads must be firmly, but flexibly, supported to keep them under control. Thermal expansion and contraction, of course, can move ponderous objects many inches. Shock and vibration, too, can make rigid support of heavy loads hazardous, due to possible serious trouble at terminals.

For installations such as these, more and more engineers are turning to *flexible* supports by Grinnell. Grinnell Variable Spring Hangers are *pre-engineered* to minimize changes in supporting force over total range of movement. Here are the important features that let these units turn in a star performance in a supporting role:

- Maximum variation in supporting force per ½" of deflection is 10½% of rated capacity — in all sizes.
- Precompression* assures operation of spring within its proper working range, as well as saving valuable erection time. Reduced over-all height saves space.
- Solid steel casing protects spring from damage and weather. Guides assure continuous alignment and concentric loading of spring.
- 18 sizes available from stock — load ranges from 53 lbs. to 12,000 lbs.
- Easy selection of proper sizes from simple capacity table.
- Installation is simplified by integral load scale and travel indicators.

**Precompression is a patented feature.*



VARIABLE SPRING HANGER
FIG. B-268

Fig. B-268, Type A, is designed for attachment to its supporting member by screwing a rod into a bushing in the top cap of the hanger. Adjustment of the hanger load is accomplished by turning the turnbuckle on the lower hanger rod until the hanger picks up the load and the load indicator points to the desired position. Six other types of attachment are available.

Grinnell Variable Spring Hangers are also available in half sizes (Fig. B-82); and in double spring sizes (Fig. B-98).

GRINNELL

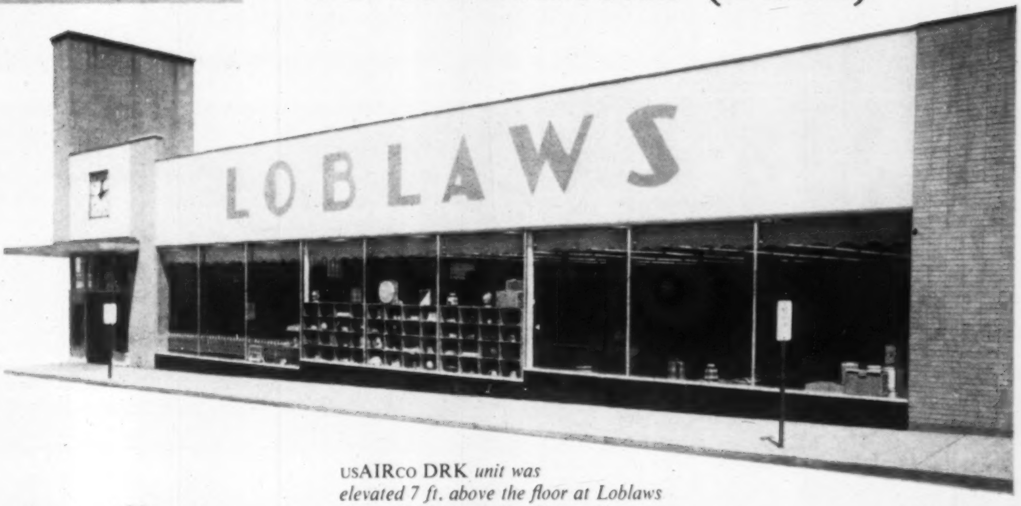
AMERICA'S #1 SUPPLIER OF PIPE HANGERS AND SUPPORTS

Grinnell Company, Inc., Providence, Rhode Island • Coast-to-Coast Network of Branch Warehouses and Distributors

pipe and tube fittings • welding fittings • engineered pipe hangers and supports • Thermolier unit heaters • valves Grinnell-Saunders diaphragm valves • pipe • prefabricated piping • plumbing and heating specialties • water works supplies industrial supplies • Grinnell automatic sprinkler fire protection systems • Amco air conditioning systems

usAIRco

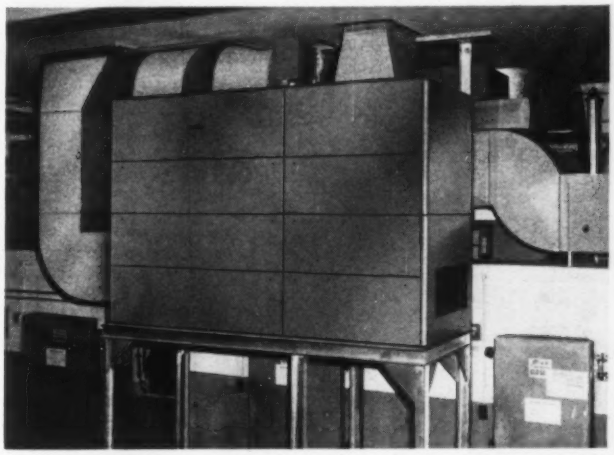
packaged central station air conditioner (DRK)



usAIRco DRK *unit was elevated 7 ft. above the floor at Loblaws Super Market, Butler, Pa. making room for storage of materials and leaving entrance to walk-in cooler unobstructed.*

Installation by
J. H. Baum Heating, Inc.
Youngstown, Ohio

licks floor space problem for chain grocery!



When Loblaw Super Market, Butler, Pa., lacked floor space for a standard air conditioning installation, the problem was solved by elevating a usAIRco DRK-20 unit above the floor, thus providing Loblaw's with the efficient, low-cost air conditioning they needed.

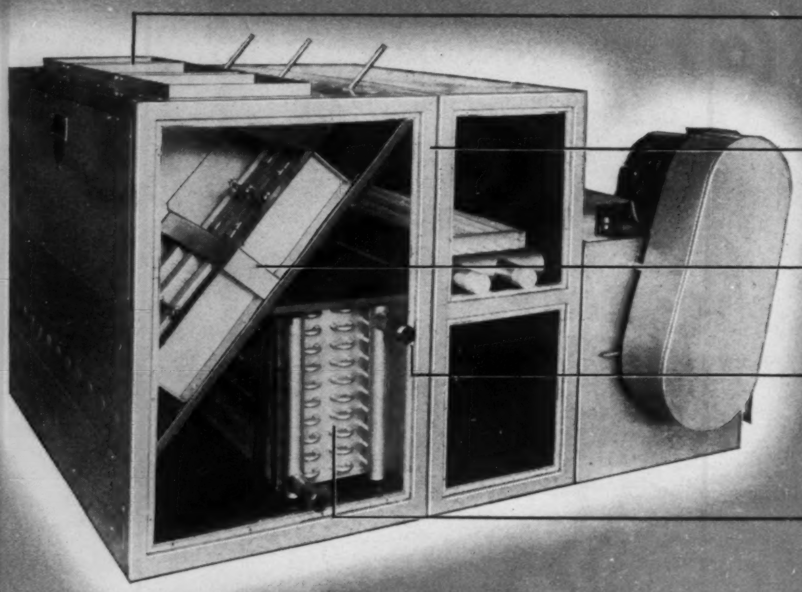
The compact structure and size of the DRK is ideal for problem installations and economical operation. Because its built-in evaporative condenser continually recirculates water, it saves 95% in water consumption. Installation costs are low because the DRK is delivered ready for operation from the factory, with all parts of the unit—blower section, compressor section and evaporative condenser—factory tested and balanced. Also, with the addition of a heating coil, the DRK will heat in winter.

Only three simple connections are needed: to ducts, water supply and drain, and power source. The DRK is available in single or dual circuit arrangements. 11 sizes, 3 through 60 h.p., to fit every requirement.

For further details write R. T. McLain

UNITED STATES AIR CONDITIONING CORPORATION
MINNEAPOLIS 14, MINN.

usAIRco
30 YEARS OF AIR CONDITIONING



DISCHARGE DUCTS may be arranged either horizontally or vertically or, if necessary, combined.

SECTIONALIZED CONSTRUCTION of all parts permits greatest ease in handling and installation. Even the heating and cooling coils are in separate sections.

DAMPER SECTION: Multiple mixing dampers regulate proportion of warm and cold air for each zone.

CONNECTIONS: Only one set of connections (heating and cooling) required by each unit regardless of number of zones.

COOLING COIL RATINGS: Tubing size, circuiting and connections have been engineered to meet load conditions for each particular coil, providing maximum heat transfer with minimum refrigerant pressure drop.

ANOTHER NEW PRODUCT IN THE EXPANDING BUSH LINE

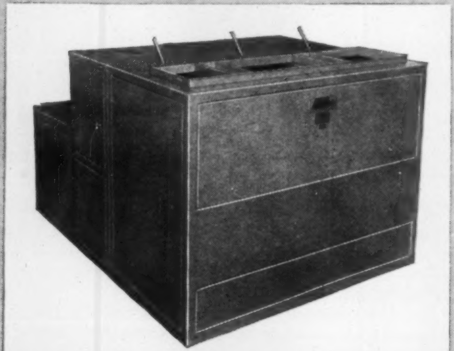
BUSH MZ MULTIZONE AIR CONDITIONING UNITS

A single unit replaces several! Bush 'MZ' Multizone Units provide simultaneous air conditioning of separate rooms or zones at any desired temperature . . . make possible *individualized* conditioning of such areas.

Steady temperature control possible with Bush 'MZ' Units is especially advantageous where the problem of fluctuating cooling and heating loads exists . . . where sun load and occupancy vary.

Contractors, architects and consulting engineers welcome the clean-lined compactness of these units . . . the sectionalized construction which permits easy handling and installation.

Capacities range from 2,560 to 24,000 C.F.M.



BUSH

Request Bulletin #805 containing complete information.

BUSH MANUFACTURING COMPANY · West Hartford · 10 · Conn.

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Heating Piping & Air Conditioning

Vol. 27 No. 5

(with which is merged the Aerologist)

DESIGN, INSTALLATION, OPERATION AND MAINTENANCE IN INDUSTRIAL, COMMERCIAL, INSTITUTIONAL AND PUBLIC BUILDINGS

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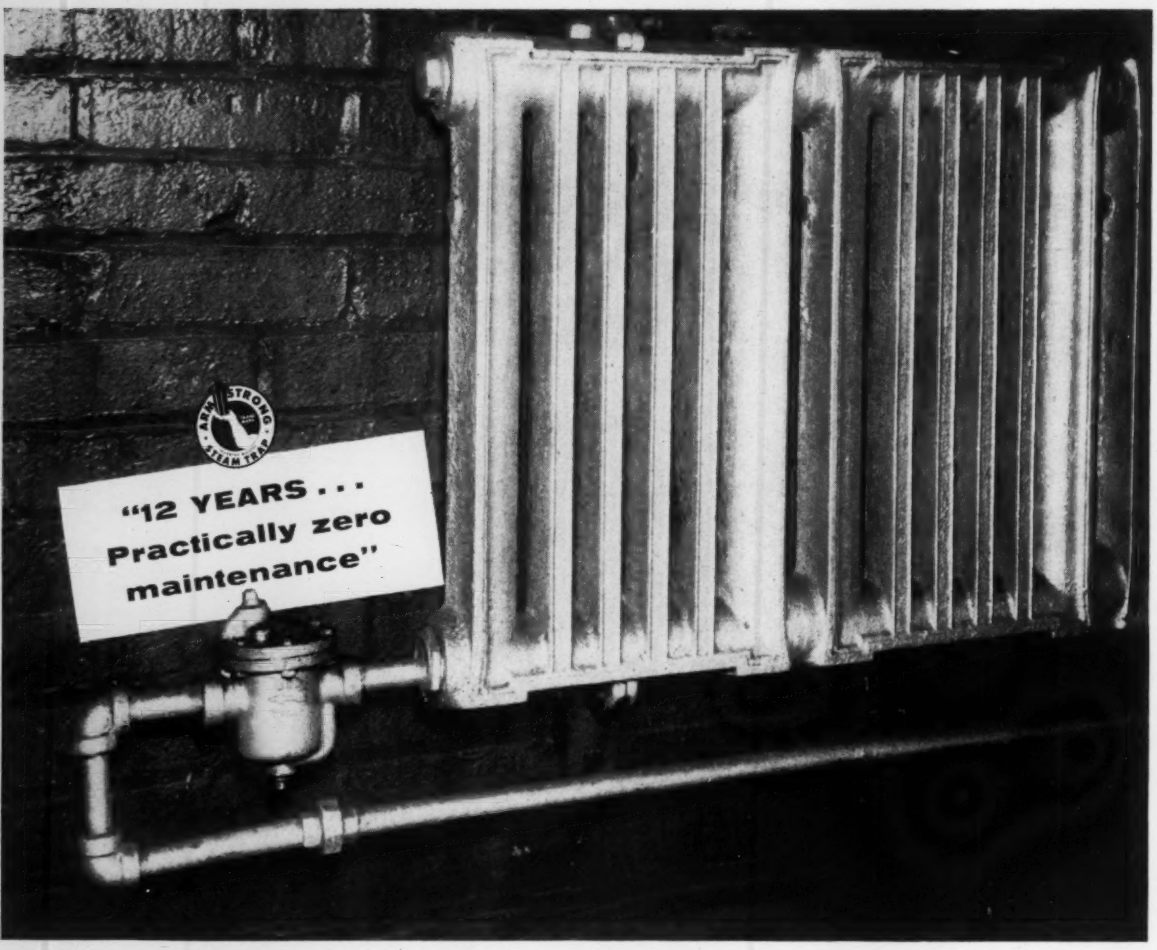
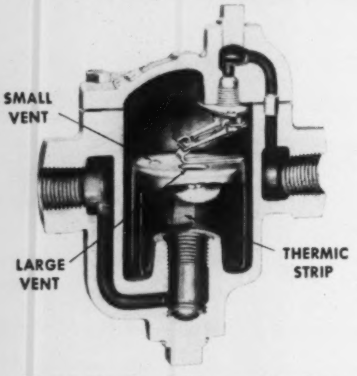


The Low Maintenance Trap for Low Pressure Heating . . .



Open Float and Thermostatic Trap

For fast heat-ups, Armstrong steam traps can be fitted with thermic buckets. These are excellent for heating systems that are shut off at night and turned on in the morning. Large opening in the bucket, controlled by a thermic strip, provides a fast discharge of air until steam enters the trap. Heat contracts the strip closing the opening. Non-condensibles that enter with the steam during normal operation are continually discharged through the small vent.

The Armstrong No. 800 trap above is operating at a 10 to 12 pound initial pressure and discharging into a return line carrying 5″ of vacuum. In 12 year's service, maintenance costs on this and 99 other Armstrong traps has been practically zero . . . so reports Mr. Thomas B. Healy, Vice President of the Liquid Veneer Corporation.

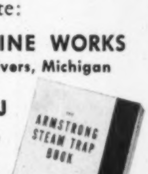
The reason behind this low cost maintenance lies in the design, workmanship and materials used in the traps. The stainless and chrome steel internal mechanism is identical in design, workmanship and materials to the internal mechanisms of forged steel traps used for 900 lb. pressure and 900°F service. It is no wonder that these traps deliver such long, trouble-free performance operating under the moderate pressures, temperatures and loads of a low pressure vacuum return heating system.

Low maintenance is only one of the reasons Armstrongs are widely used for heating. There are others . . . uniform heating . . . faster heat-ups . . . easy cleaning and inspection . . . guaranteed satisfaction . . . competitively priced . . . backed by a nation wide sales and service organization. Ask your Armstrong Representative for complete details or write:

ARMSTRONG MACHINE WORKS
874 Maple Street, Three Rivers, Michigan

ASK FOR CATALOG J

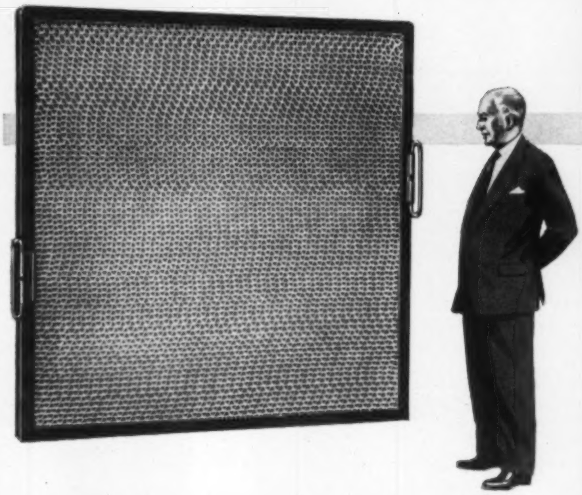
. . . . . contains complete installation and service information, physical data and prices for all Armstrong traps and accessories.



Application Engineered

ARMSTRONG STEAM TRAPS

You're really looking at 9 air filters!



Because one filter won't do *every* air cleaning job, Farr Company has nine standard types designed to handle practically any dirt condition. Each embodies the famous herringbone-crimp media design and other Far-Air quality features, but differs in materials, thickness, etc. When you select the type you need from the Far-Air line, you are assured of getting the most practical solution for your particular dust problem. Remember, the operating efficiency of the entire air handling system is dependent on the filters used. That is why it is important that the *right type* filters be installed. Farr field engineers will be happy to study your air cleaning problems and make specific recommendations.

Type 68—2"—finer mesh media and tighter pack for higher efficiency on small particles.

Type 44-68—4"—double packed for special applications requiring the highest efficiency.

Type 44—1"—gable crimped for high efficiency; for ventilation, package air conditioners, furnaces, etc.

Type 44—2"—general ventilation for dirt, lint, paint, grease, oil, etc.

Type 44—4"—for greater dirt capacity.

Type MZ—2"—zinc chromate painted before and after assembly; hot dipped galvanized frame; marine ventilation application.

Type MZ—4"—same except 4" thick.

Except as noted, filters are made of zinc electroplated herringbone-crimp steel screen media in sturdy steel frames. Other materials are aluminum, stainless steel and monel. Available in all sizes.

Type C4C4—2"—all copper media and frame; for corrosion resistant water eliminators, etc.

Type C4C4—4"—same except 4" thick.

Send for complete catalog of FAR-AIR products to Farr Company, P.O. Box 45187, Airport Station, Los Angeles 45, California

FAR-AIR
FARR COMPANY

ORIGINATORS OF FAR-AIR CERTIFIED FILTER SERVICE

FARR COMPANY

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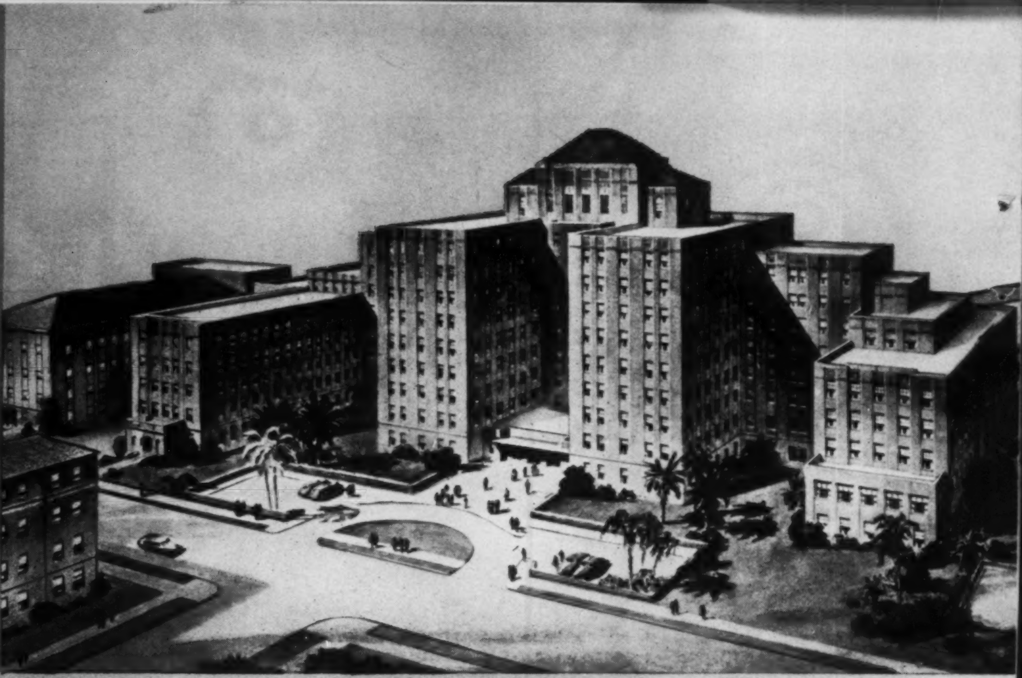
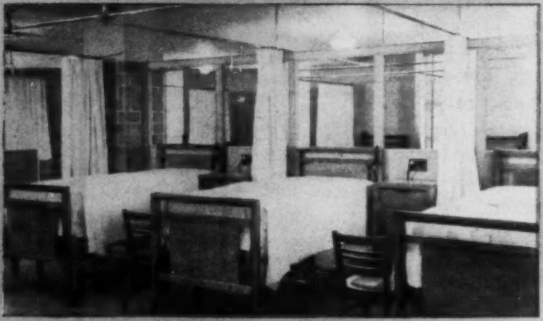
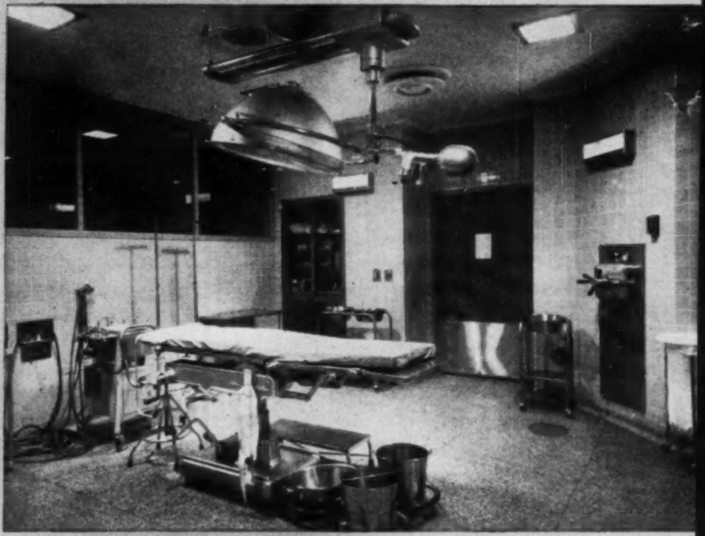


One of the most important features of this 1000 bed hospital valued highly by patients and staff alike is: It is completely air conditioned throughout and Powers controlled.

Left: View of Entrance Lobby with Portraits of the Founder, John Sealy, Sr., and John Sealy, Jr.

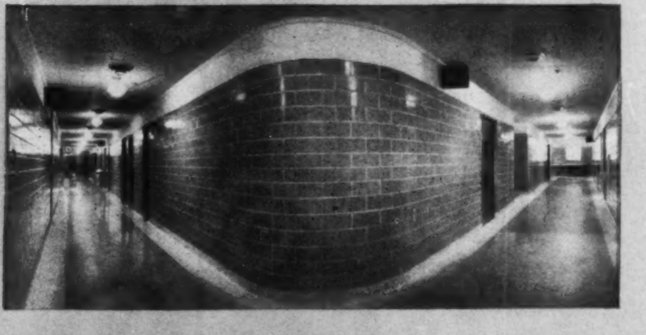
Below: Post Operative Recovery Dept. has nine beds.





Below: Research Laboratory

Below: Surrounding Corridors for Central Operating Rooms

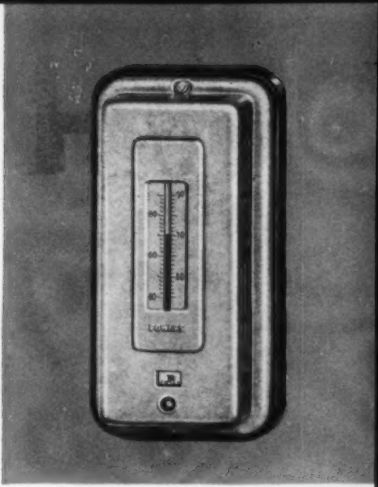


Behind the scenes . . .

in this modern hospital **POWERS**

Automatic TEMPERATURE and HUMIDITY Control

is contributing to the quality of patient care



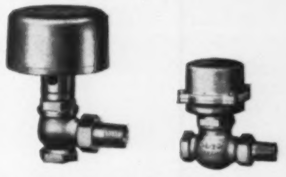
Radial Type Surgical Department shown in drawing below, is one of the many new concepts incorporated in this center for healing.

The radial type plan is based on a theory of centralization permitting a compact layout to increase nurses' efficiency by reducing their steps. Powers automatic control of the working climate further increases staff efficiency and contributes to the health and comfort of the patients.

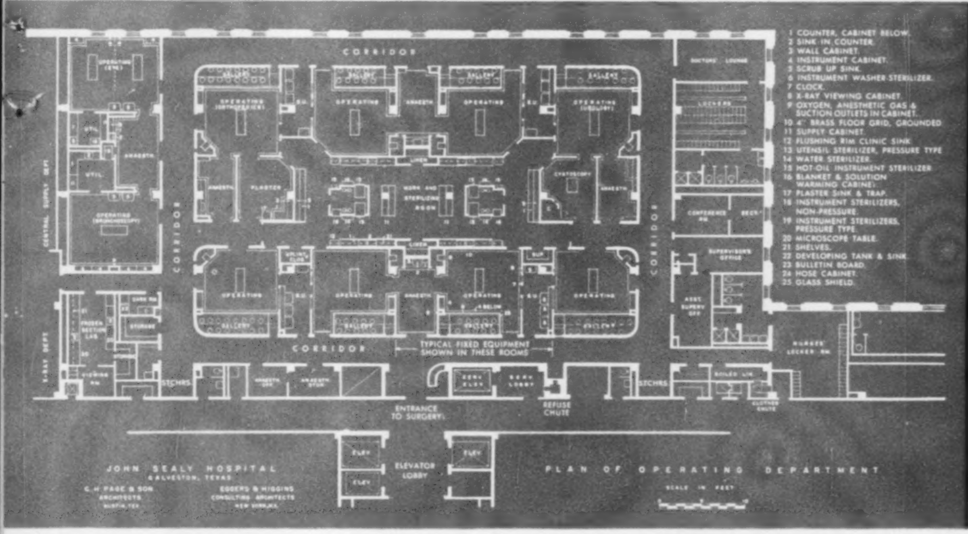
Being completely air conditioned the building requires 1250 tons of refrigeration.

Almost 700 Powers Gradual Acting Thermostats here control 125 Damper operators and 930 PACKLESS Valves on air conditioning units and convectors. Other controls consist of 7 Series 100 Master-Submaster Controller Recorders, Pressure Indicating Controllers and 70 Powers FLOWRITE Diaphragm Valves.

(c14)



Powers PACKLESS Control Valves – one of the many superior features of a Powers control system. They eliminate packing maintenance and leakage of water or steam and give smooth accurate control.


1 COUNTER, CABINET BELOW.
2 SINK IN COUNTER.
3 WALL CABINET.
4 INSTRUMENT CABINET.
5 SCRUB UP SINK.
6 INSTRUMENT WASHER-STERILIZER.
7 CLOCK.
8 X-RAY VIEWING CABINET.
9 OXYGEN, ANESTHETIC GAS & SUCTION OUTLETS IN CABINET.
10 4" BRASS FLOOR GRID, GROUNDED
11 SUPPLY CABINET.
12 FLUSHING RIM CLINIC SINK
13 UTENSIL STERILIZER, PRESSURE TYPE
14 WATER STERILIZER.
15 HOT-OIL INSTRUMENT STERILIZER
16 BLANKET & SOLUTION WARMING CABINET.
17 PLASTER SINK & TRAP.
18 INSTRUMENT STERILIZERS, NON-PRESSURE.
19 INSTRUMENT STERILIZERS, PRESSURE TYPE.
20 MICROSCOPE TABLE.
21 SHELVES.
22 DEVELOPING TANK & SINK.
23 BULLETIN BOARD.
24 HOSE CABINET.
25 GLASS SHIELD.
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OPERATING
GALLERY
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X-RAY DEPT
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ELEVATOR LOBBY
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Central Sterilizing Room

Consult Powers when you want thermostatic control for any type of new or existing building. No other firm makes as big a variety of temperature controls for heating and air conditioning systems, shower baths, hydrotherapy, X-Ray film developing, water heaters, fuel oil preheaters and other hospital applications.
For further information call your nearest Powers office or write us direct.

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Damper Operator

THE POWERS REGULATOR COMPANY

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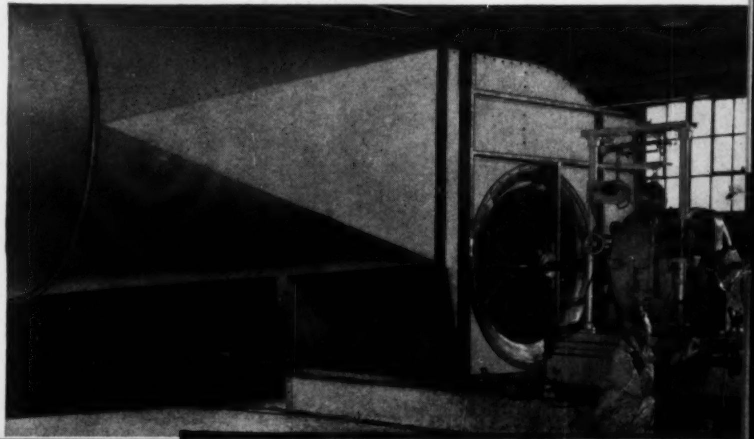
See your phone book

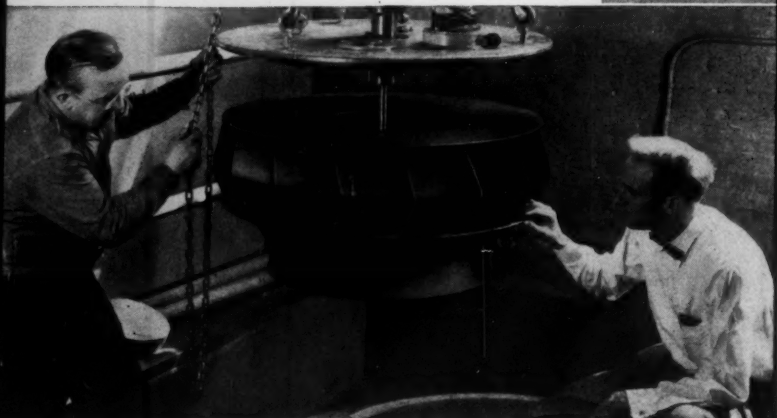
POWERS CONTROL

More than 60 years
of Automatic Temperature
and Humidity Control

WHY "BUFFALO" AS SPECIFIED

★ What will this wheel design deliver at various static pressures? What are the horsepower requirements? Noise level? And what's the best housing? Endless testing like this in the "Buffalo" Laboratory — plus endless designing and redesigning — brought you the famous high-performance Type BL Limit-Load Ventilating Fan — and will continue to bring you the latest and finest in fans. You can expect this inbuilt performance whenever you order a "Buffalo" Centrifugal, axial flow or propeller fan.





ALL TESTS in the complete "Buffalo" laboratory are conducted in strict accordance with the test code adopted jointly by NAFM and ASH&VE.

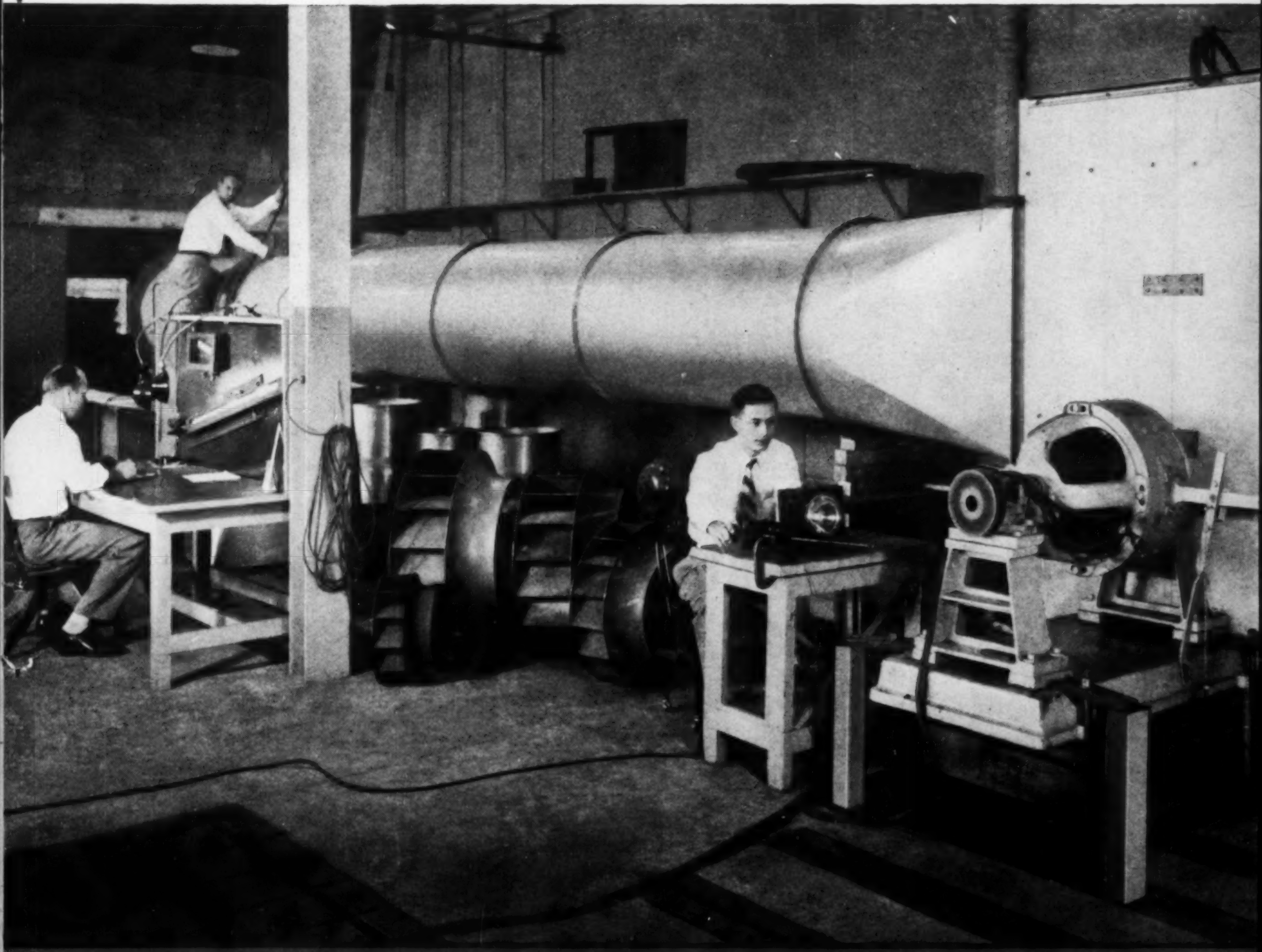
WHERE WE TRY TO DESTROY WHEELS — the "Buffalo" vacuum test pit where wheels are revolved at many times their operating speeds to discover — and correct — any point of structural weakness. Further assurance of a better fan buy when you specify "Buffalo".

BUFFALO FORGE

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

VENTILATING • AIR CLEANING • AIR TEMPERING • INDUCED DRAFT

FANS PERFORM*



Testing fan wheel performance in the "Buffalo" Laboratory

* *Performance — another term for the "Buffalo" "Q" Factor — the built-in Quality which provides trouble-free satisfaction and long life.*

"Buffalo"

COMPANY 171 MORTIMER ST. • BUFFALO, N. Y.

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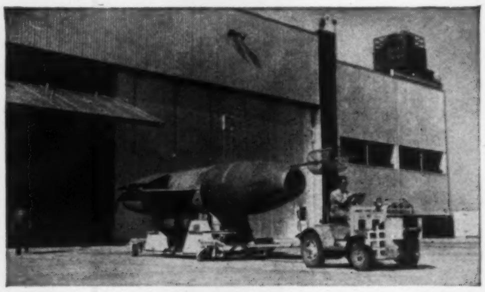
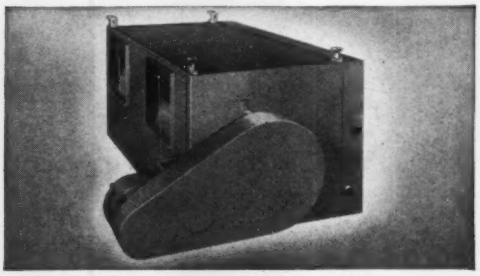
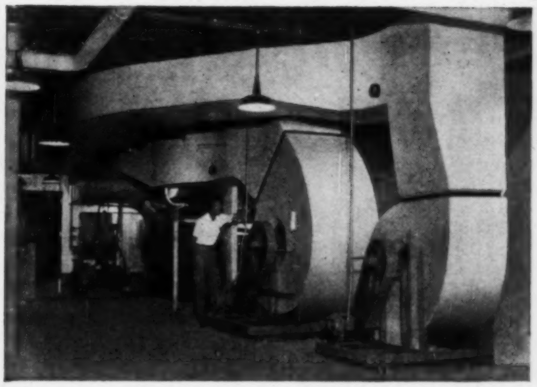
Chance Vought uses air conditioning



Chance Vought, maker of the famous Corsair, is now in full production of delicately machined guided missile Regulus (above) and twin-jet Cutlass (left).



American Blower H&V Units circulate conditioned air in hangars; 21 of these units in missile hangar provide complete change of air every 12 minutes.



Five American Blower Supply Fans and a Sprayed Coil Dehumidifier furnish conditioned air for offices, test laboratory in upper floors of missile hangar.

Chance Vought (foreground) and adjoining plants are leased from the U.S. Navy. Entire air-conditioning installation contains 7400 tons of refrigeration – of which no less than 6600 tons are applied to the load through American Blower equipment.

by the acre in modern Texas factory

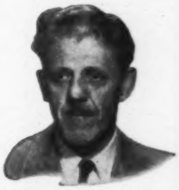
American Blower equipment air conditions more than 3 million sq. ft. of factory, office, and hangar space at Chance Vought – the equivalent of nearly 70 acres!

Chance Vought Aircraft, Incorporated, Dallas, Texas, is one of America's foremost aviation pioneers – having produced planes for the Navy since 1917. Currently, it's making some of the world's fastest aircraft and newest guided missiles.

To help meet exacting manufacturing standards – and to insure efficient production – Chance Vought uses American Blower equipment to air condition more than 3,000,000 sq. ft. of floor space in its factory, offices and hangars.

The system – which includes American Blower Supply and Exhaust Fans, Air Conditioning Units, Chilled Water Cooling Coils, Heating & Ventilating Units, Sprayed Coil Dehumidifiers, Utility Sets, and Steam Coils – accurately controls humidity; maintains pre-selected indoor temperatures, ranging from 75° to 85° F. – providing ideal year-round manufacturing and working conditions.

Do you have an air-conditioning or air-handling problem? American Blower engineers have a complete knowledge of the special problems of many industries. A call, right now, to your American Blower or Canadian Sirocco Branch Office is all it takes to have this expert know-how at your disposal.



Ross Zumwalt, missile-hangar engineering consultant: "American Blower equipment gives top performance."

Carl Wallace, missile-hangar contractor: "American Blower helps contractors in every way."

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN • CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO

Division of American Radiator & Standard Sanitary Corporation

AMERICAN BLOWER

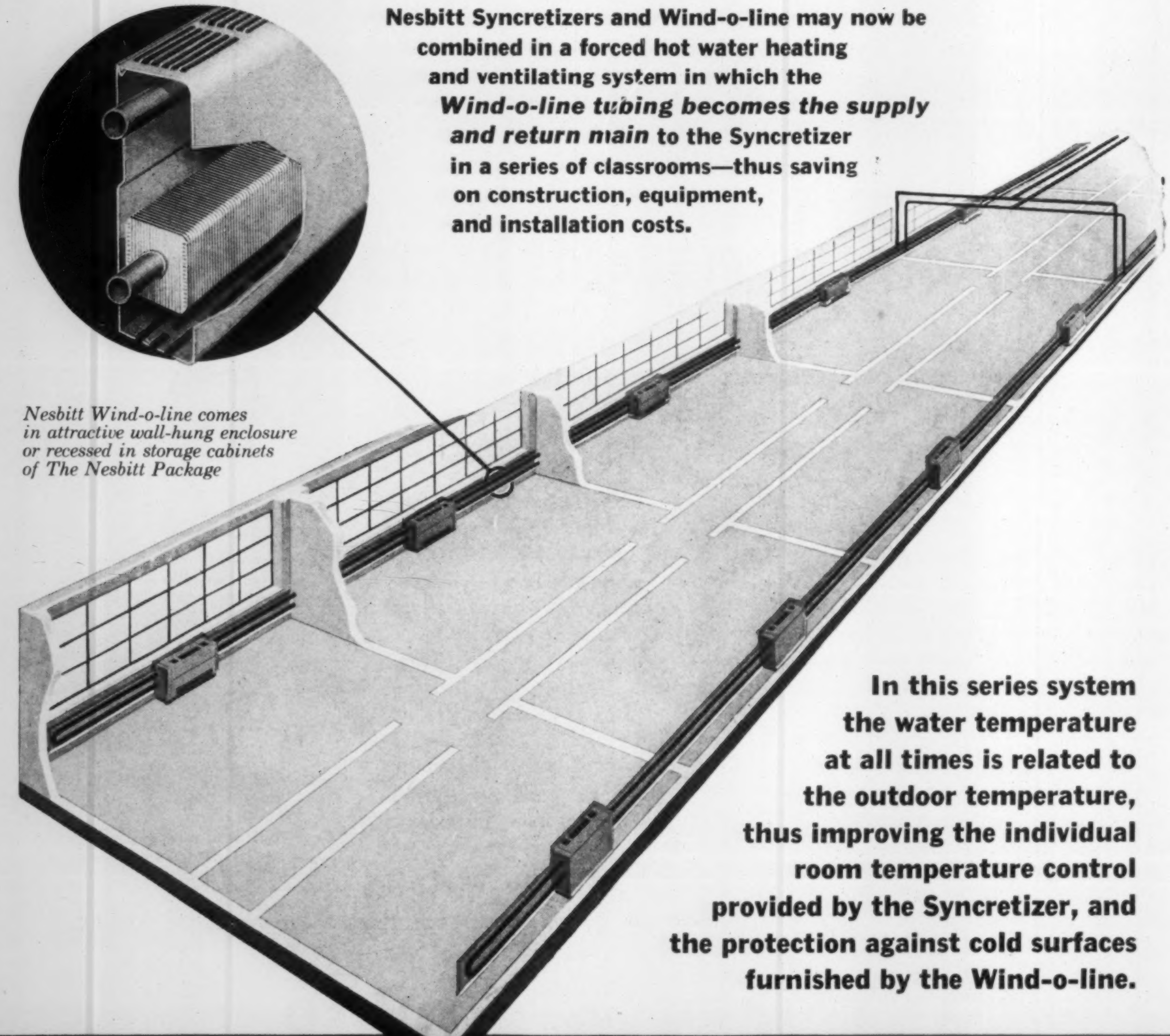
Serving home and industry: AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS • SUNBEAM AIR CONDITIONERS

a new major advancement...

Nesbitt

SERIES HOT WATER

Nesbitt Syncretizers and Wind-o-line may now be combined in a forced hot water heating and ventilating system in which the *Wind-o-line tubing becomes the supply and return main* to the Syncretizer in a series of classrooms—thus saving on construction, equipment, and installation costs.



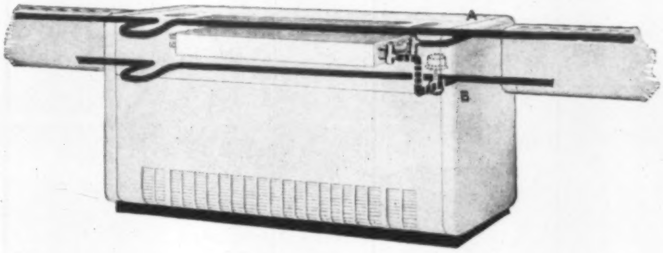
Nesbitt Wind-o-line comes in attractive wall-hung enclosure or recessed in storage cabinets of The Nesbitt Package

In this series system the water temperature at all times is related to the outdoor temperature, thus improving the individual room temperature control provided by the Syncretizer, and the protection against cold surfaces furnished by the Wind-o-line.

Telephone, wire, or write today for more information:

school mechanical system costs **reduced**
classroom comfort and protection **increased**

WIND·O·LINE SYSTEM



Packaged piping reduces installation cost.
(a) Crossover return tubing, expansion loop, and air vent fitting come pre-assembled and connected to the heating element.
(b) Crossover supply tubing, expansion loop, and balancing valve are furnished installed, leaving a minimum of piping at the site.

IF YOU are interested in school construction costs, it will pay you to study how this latest Nesbitt development meets today's needs and gives more for the school-building dollar.

In forced hot water applications Nesbitt Syncretizer heating and ventilating units with Wind-o-line radiation may be installed in series-loop circuits, in which the copper tubing of the Wind-o-line system serves as the only required supply and return piping for multiple-classroom groupings or entire wings.

COSTS REDUCED *Savings in equipment:* Smaller pipes and pumps are required because the Nesbitt System is designed to provide the needed heating capacity with water quantities of from one half to one third those required in conventional systems. Saves on both first cost and operating cost.

Savings in construction: Wind-o-line supplies Syncretizers, eliminating costly pipe trenches, mains, runouts and pipe covering in much of the building. Other piping is simplified.

Savings in installation: Mains and piping are smaller, shorter, simpler. Packaged piping within the Nesbitt Syncretizer unit ventilator reduces installation labor at the site. See above.

COMFORT INCREASED *Variable water temperature control:* Relating the available heat directly to outdoor temperatures improves the control of individual room temperature by the Syncretizer.

Improved cold surface protection: Because the system water temperature increases as outside temperature falls, Wind-o-line protection against cold window downdraft and bodily heat loss is continuously related to actual needs.

Off-time temperature maintenance: Without additional investment in equipment, the Nesbitt System maintains safe basic building temperatures during overnight, holiday, week-end shutdowns.

The Series Wind-o-line System
offers you these

advantages

Better room temperature control

Increased protection against cold surfaces and window downdraft

Costly pipe trenches eliminated

Pipe covering and traps eliminated

Smaller pumps cost less, operate with greater economy

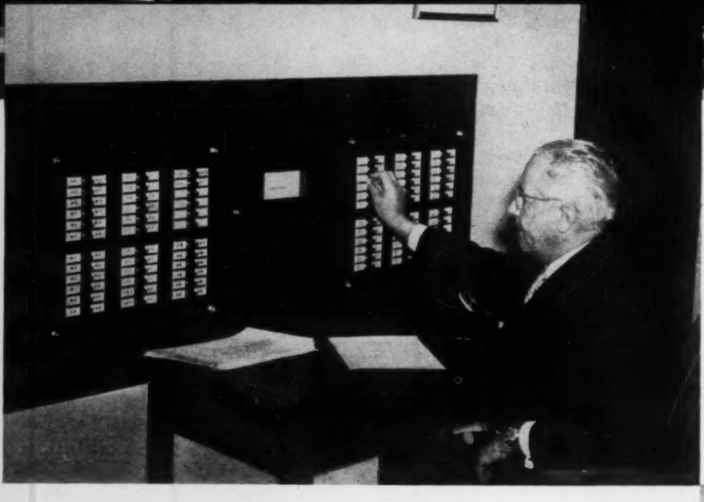
Shorter, simpler mains and piping

Packaged piping in the Syncretizer reduces installation costs

No extra controls and equipment required for night heating

Made and sold by John J. Nesbitt, Inc., Philadelphia 36, Pa.—Sold also by American Blower Corporation

UNITED BENEFIT LIFE INSURANCE COMPANY



FAHRENHEIT AT FINGERTIPS

144 different temperatures at scattered locations throughout the home office building of Mutual of Omaha and United of Omaha in Omaha, Nebraska, can be checked at the pressing of a button by means of multi-point *ElectroniK* Precision Indicator. The building's mechanical engineering superintendent can get the temperature data he needs quickly and accurately, without moving from the central control panel.

- **FOR MEASURING AND CONTROLLING**
  - steam heating coils
  - reheat coils
  - sequenced heating and cooling coils
  - primary air supply systems
  - chilled water temperatures
  - space, air, liquid and steam temperatures
  - differential pressures
  - air conditioning loads
  - . . . and many others

- **BROWN INSTRUMENTATION INCLUDES . . .**

ElectroniK
temperature recorders
and controllers

ElectroniK
multi-point
Precision Indicators

For your air handling system's central control–

it pays to specify Brown Instruments

THE CONTROL centers of your building's air handling system can give you the full benefits of increased efficiency, simplified supervision and peak performance when you utilize Brown recording and controlling instruments.

The ideal companions for Honeywell air-conditioning controls, Brown instruments encompass a diversified line. They cover literally any variable that can be encountered in a complex system . . . temperature, pressure, flow and humidity.

You get plus values in performance. Brown instruments are famous for their ability to deliver high quality, trouble-free service that results in maximum operating economies, power savings and maintenance of comfort. They're the leading choice of industry for process control applications . . . and they've been selected for many major air handling installations.

You get plus values in engineering. Made by the Brown Instruments Division of Honeywell, the world's largest producer of controls, these instruments are backed by extensive know-how in the air handling field. They are custom-fitted to the individual job by men who are thoroughly familiar with the equipment, processes and specifications peculiar to this type of application.

You get a single responsibility for control. Only Honeywell, with its complete family of instruments and controls, can give you the advantage of a single source for all control equipment for the entire air-handling installation.

Your local Honeywell salesman will be glad to discuss how Brown instruments can fit into your system's control center. Call him today . . . he's as near as your phone.

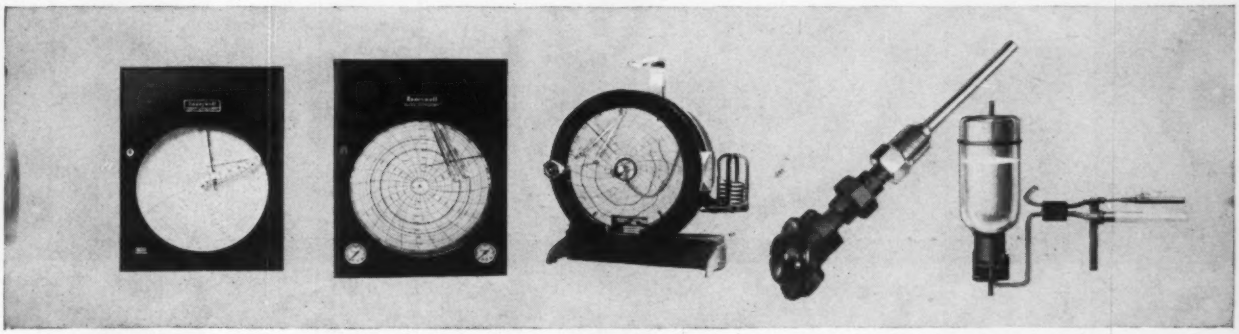
MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.—in Canada, Toronto 17, Ontario.

H HONEYWELL

MINNEAPOLIS **Honeywell**
BROWN INSTRUMENTS

First in Controls

● **REFERENCE DATA: Write for new Catalog SA 1810 A.**



Brown Flow Meters . . . indicating, recording, controlling, integrating

Brown Pressure Recorders

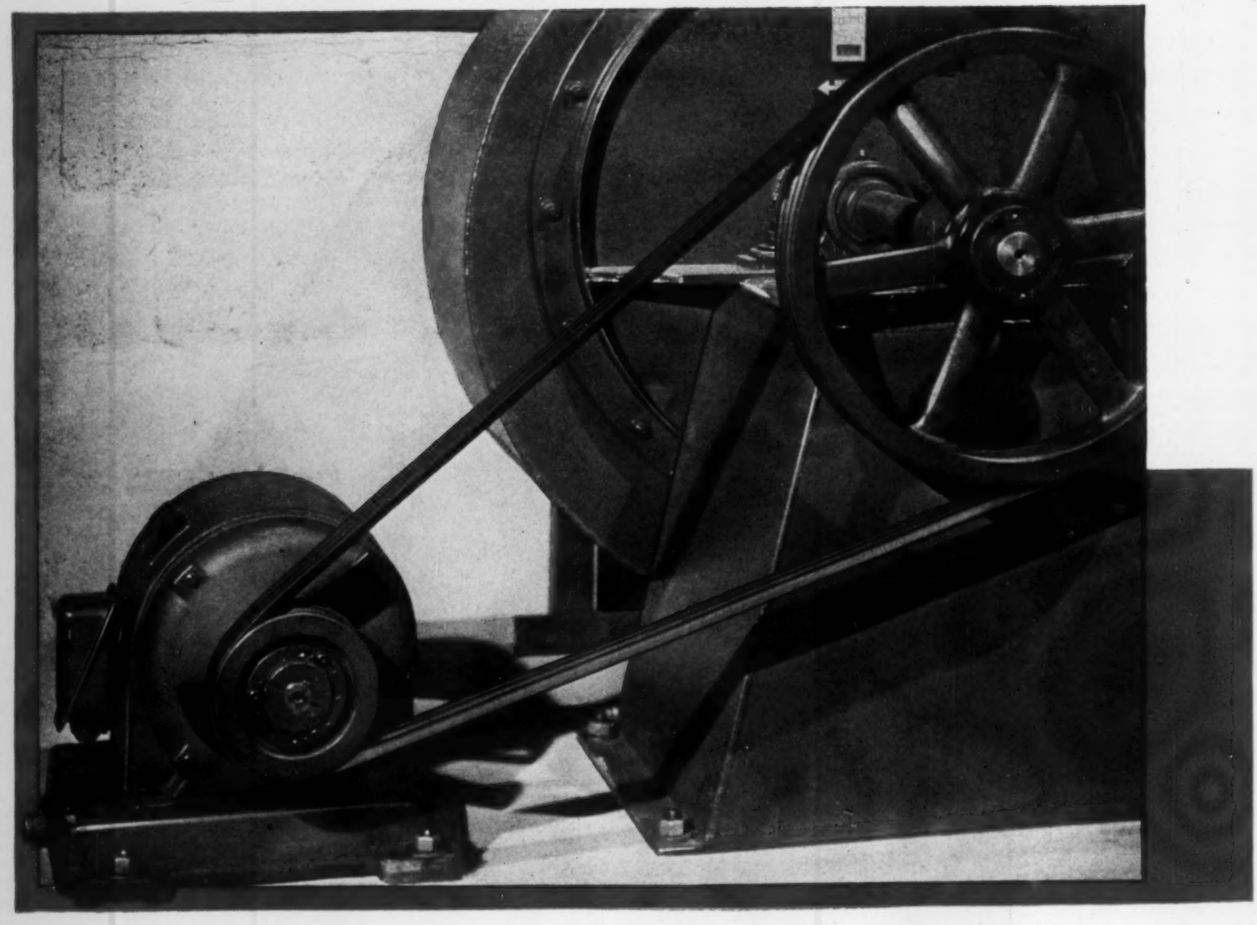
Brown Humidity Recorders

Resistance thermometer bulbs

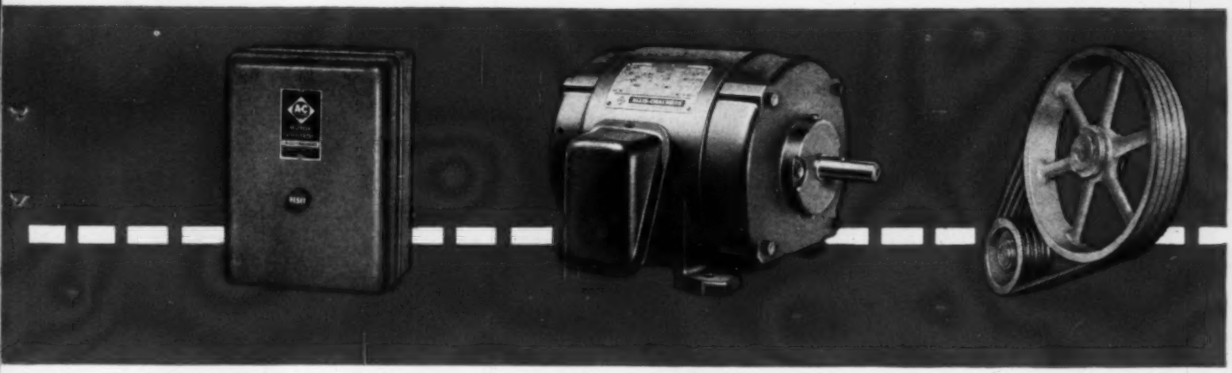
Wet and dry bulb assemblies

Use this Combination of
Control-Motor-Drive

Save Engineering



ALLIS-



...Simplify Service

These Components are Designed to Work Together and They're Backed by Nation-Wide Service

Cut Engineering Time and Cost. Select all components for your complete drive . . . motor, control and *Texrope* V-belt drive . . . from one source. All ratings are coordinated to make selection easier. Parts match up properly.

Reduce Installation Costs. Parts fit together easily at assembly because they are designed and built to be used together . . . to fit a single set of standards. And, of course, you have one responsibility for the performance of the complete drive unit . . . one reliable guarantee of satisfaction.

Get Nation-Wide Service. Allis-Chalmers continues to serve you and your customers after your equipment is installed. In addition to 76 district offices, there are almost one hundred Certified Service Shops located in every industrial area in the country. These shops are carefully selected, independent shops that use only factory-approved parts and methods in servicing Allis-Chalmers equipment.

For an experienced specialist to help you select the best drive for your installation . . . for coordinated equipment . . . call your nearby Allis-Chalmers District Office, or write Allis-Chalmers, Milwaukee 1, Wisconsin.

Send for FREE engineering literature

Control

Handy Guide to Starters	14B7733
Reduced-Voltage Starters	14B7215

Motors

Handy Guide to Motor Selection	51B6052
Squirrel-Cage Motors	51B6210
TEFC Motors	51B7225

Texrope Drives

Handy Guide to *Texrope* Drives	20B6051

CHALMERS

Texrope is an Allis-Chalmers trademark.

A-C ALLIS CHALMERS

12
3

One reason Westinghouse Air Conditioning lasts longer and needs less maintenance is the Stroboscopic Balancing Test you see at left. The crank-shaft-assembly of every compressor is inspected under the penetrating stroboscopic beam. This beam spots the minutest out-of-balance surface, and highlights it, by number, for correction. This is the type of testing that results in:

19 Years of Uninterrupted AIR CONDITIONING with unbelievably little maintenance

In 1936, the Barbizon-Plaza Hotel, overlooking Central Park in New York City, installed a Westinghouse Air Conditioning System. Since then it has operated 16 hours a day, April to November, without interruption.

Today, 19 years later, the original Westinghouse Compressor that makes up the heart of the system is still performing at peak capacity.

And unbelievable as it sounds, this Westinghouse compressor has *never* been opened for inspection—or repaired. It is still in use—after 19 years.

HELPFUL GUIDE TO COMPLETE WESTINGHOUSE LINE . . . *Yours for the asking.* To show you at a glance the complete range of Westinghouse equipment, Westinghouse offers a handy reference folder on commercial and industrial air conditioning. Covers Unitaire® package units, heat pumps and components for field-assembled installations. For your free copy, write directly to: *Westinghouse Air Conditioning, Dept. HP-2, Box 510, Staunton, Va.*

YOU CAN BE SURE . . . IF IT'S Westinghouse

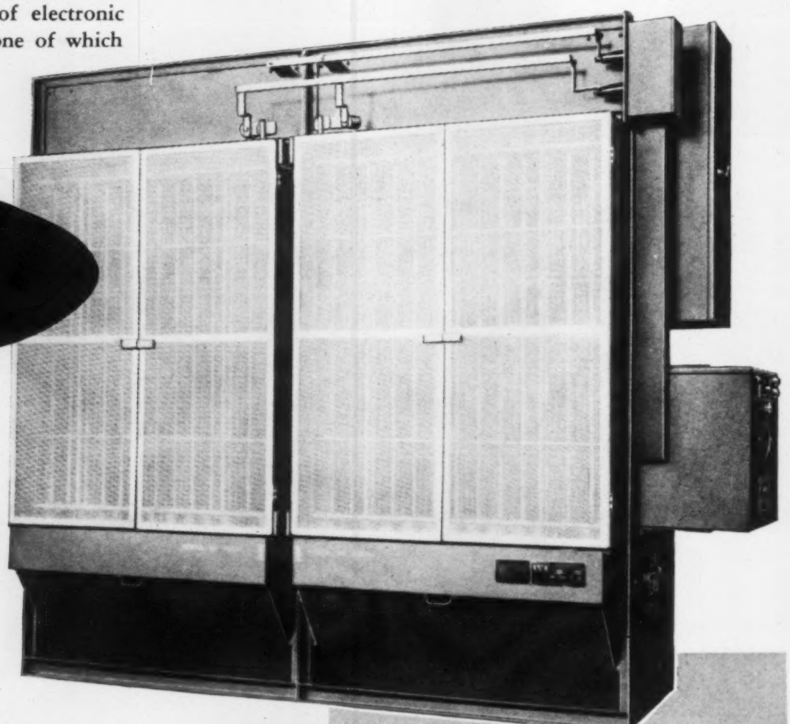
J-80472

ELECTRONIC AIR
As You Like It!

Only AAF Offers Electronic Precipitators in a Range of Efficiencies with a Choice of Maintenance Methods

LOOK them over! This is AAF's line of electronic precipitators. All are highly effective in the removal of dust and smoke. But each was designed with a different group of needs in mind. Efficiency ratios, maintenance methods, air volumes, space requirements and initial cost are all vital factors that vary with individual jobs. That's why AAF offers you the proven benefits of electronic precipitators in three distinct "packages"—one of which is certain to solve your air cleaning problems in the manner and at the cost that insures a maximum return on your "clean air investment".

For complete product information, call your local AAF representative or fill out and mail coupon.

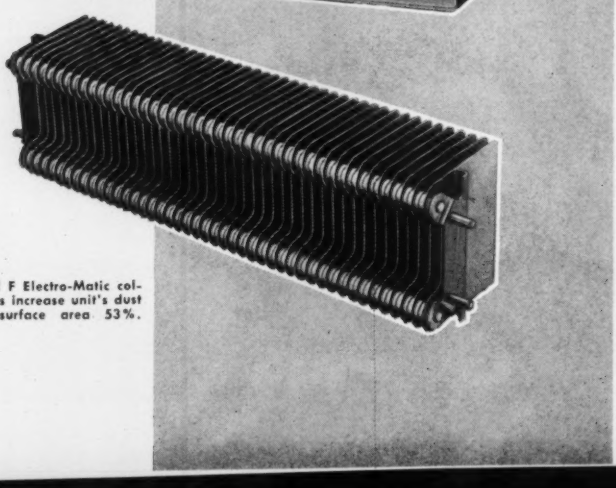


NEW!

AAF MODEL F
Electro·MATIC

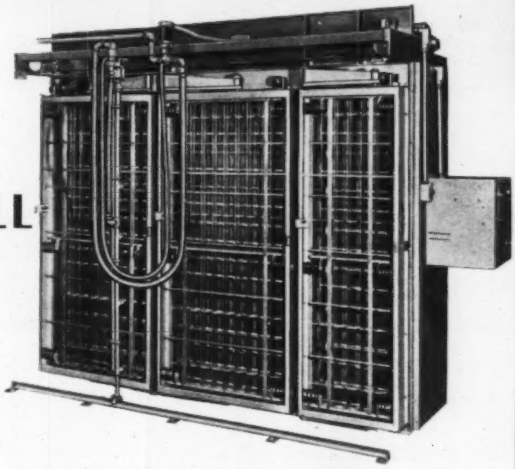
For 'Round the Clock Delivery Of Uniformly Clean Air

HERE'S the "robot" of modern electronic precipitators. The Model F Electro-Matic's high efficiency remains constant because of continuous, self-cleaning action. There's no dependence on the whims of a maintenance crew—no time out for washing down plates with hot water—no need for extra water and sewer connections. Electro-Matic's collector plates are automatically cleaned and re-oiled daily—are always in peak condition for the precipitation of dust and smoke particles. New type collector plates increase surface area 53% to further reduce possibility of dust build-up and insure constant low resistance.



New Model F Electro-Matic collector plates increase unit's dust collecting surface area 53%.

CLEANING

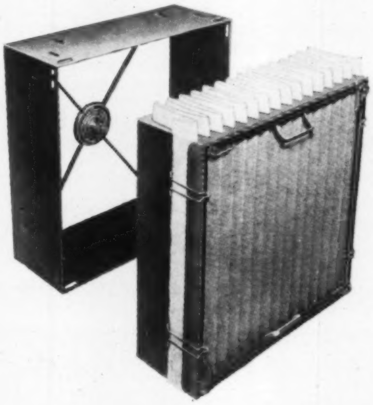


Electro·CELL

With TYPE H WASHER

Featuring "Push-Button" Maintenance

A stationary-plate type electronic precipitator which, with the addition of the Type H Washer, provides for the washing of collector plates by a set of traveling spray nozzles. The operation is fully automatic after starting button is pushed. If manual cleaning is preferred, plates may be serviced in place or easily removed for inspection.



Electro·PL

The Low Cost, Dry-Type Electronic Filter

This electronic air filter offers double protection in that its Airmat paper media continues to filter the air even if the electronic action becomes inactive. When the low cost Airmat paper has accumulated a full dust load, it is discarded and easily replaced with clean media which returns the filter to its original efficiency. An Electro-PL Unit consists of a frame and collector element. By riveting frames together, units are quickly assembled into straight bank or "V" arrangement.

AAF

herman nelson

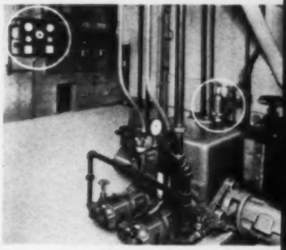
American Air Filter

COMPANY, INC.

373 Central Avenue, Louisville 8, Kentucky
American Air Filter of Canada, Ltd., Montreal, P. Q.

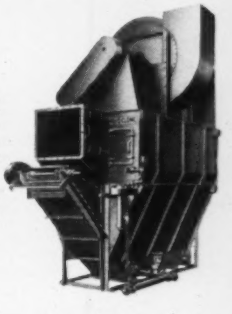
AAF herman nelson

BETTER AIR IS OUR BUSINESS!



illinois Selectotherm — an automatically controlled high vacuum steam heating system which, through single dial control, balances heat supply against heat loss to provide even, constant warmth.

herman nelson Unit Blowers — a new, diversified line of direct and belt driven centrifugal fans available in a wide range of wheel diameters and capacities.



AAF Type N ROTO-CLONE—a high efficiency hydro-static precipitator designed for the collection of both coarse particles and extreme fines in excessive concentrations. Available in exhaust volumes up to 50,000 cfm.

American Air Filter Company, Inc.
373 Central Avenue, Louisville 8, Kentucky

I would appreciate receiving catalogs describing the following equipment—

- ☐ **AAF** Electronic Precipitators
- ☐ **illinois** Selectotherm
- ☐ ***herman nelson*** Unit Blowers
- ☐ **ROTO-CLONE** Dust Control Units

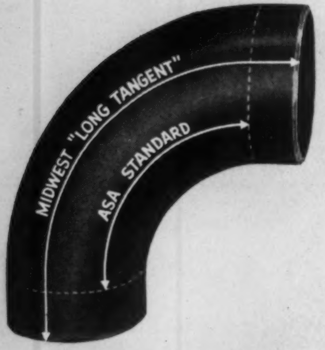
Name____________________

Company____________________

Street____________________

City____________________State_____

THESE MIDWEST "LONG TANGENT" ELBOWS SAVED $4121 IN PIPE



MIDWEST "LONG TANGENT" ELBOWS COST NO MORE THAN OTHER ELBOWS

Here are 1227 Midwest "Long Tangent" Elbows (12", 14" and 16" standard weight) ready for shipment to a chemical plant. Each Midwest "Long Tangent" Elbow has a straight section on each end equal in length to ¼ the nominal pipe size. Thus a 12" elbow saves 6" of 12" pipe while a 16" elbow saves 8" of 16" pipe. It doesn't take long to save a lot of pipe and a lot of money . . . in this instance $4121.

But saving pipe is not the only advantage of Midwest "Long Tangent" Elbows. They often eliminate short nipples and their extra welds . . . save time and money in lining up and clamping pipe and fittings . . . slip-on flanges are more easily applied. For all the facts, write for Catalog 54.

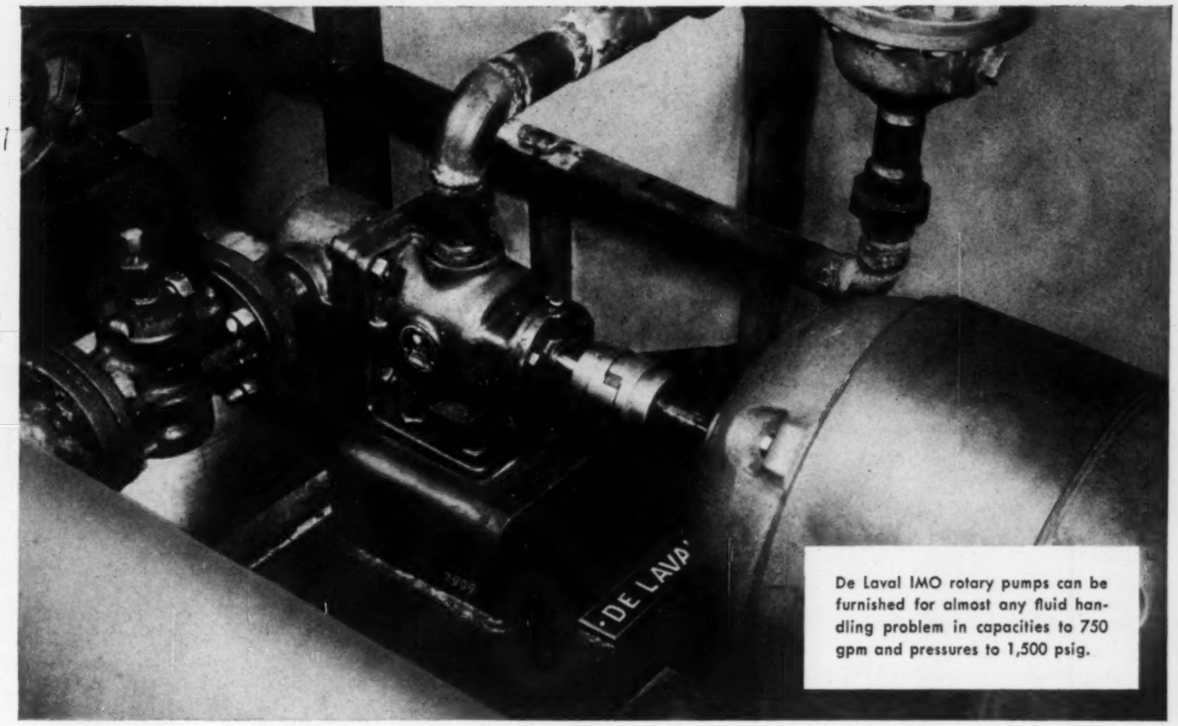
MIDWEST PIPING COMPANY, INC.
Main Office: 1450 South Second Street, St. Louis 4, Mo.
Plants: St. Louis, Passaic, Los Angeles and Boston

Sales Offices
New York 7—50 Church St. • Chicago 3—79 West Monroe St.
Boston 27—426 First St. • Los Angeles 33—520 Anderson St.
Houston 2—1213 Capitol Ave. • Tulsa 3—224 Wright Bldg.
Cleveland 14—616 St. Clair Ave.
STOCKING DISTRIBUTORS IN PRINCIPAL CITIES

MIDWEST WELDING FITTINGS

MIDWEST WELDING FITTINGS Improve Piping Design and Reduce Costs

7055



De Laval IMO rotary pumps can be furnished for almost any fluid handling problem in capacities to 750 gpm and pressures to 1,500 psig.

What to Look for in a Rotary Screw Type Pump

By W. J. Mongon, *Assistant Chief Engineer*
De Laval Steam Turbine Company

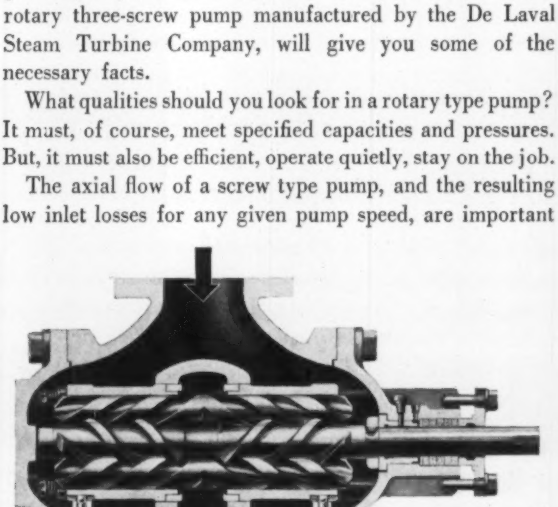
A sound knowledge of design, and how it affects performance, is the best insurance a buyer can have that he will get the pump he needs. This brief analysis of the IMO, a rotary three-screw pump manufactured by the De Laval Steam Turbine Company, will give you some of the necessary facts.

What qualities should you look for in a rotary type pump? It must, of course, meet specified capacities and pressures. But, it must also be efficient, operate quietly, stay on the job.

The axial flow of a screw type pump, and the resulting low inlet losses for any given pump speed, are important benefits that should be considered in making pump selections. The absence of timing gears and other mechanical features of construction also enable the De Laval IMO pump to operate at direct-connected motor and turbine speeds . . . to handle viscous liquids and high suction lifts.

One of the most important features of the IMO pump is the hydraulic turning of the idler or sealing rotors. The central or power rotor is the pumping element; the liquid pumped turns the sealing rotors.

A screw type pump is well suited for applications where pulsation-free flow is desirable. The axial flow of the liquid without trapping and the unique thread form which keeps closures fluid-tight contribute to quiet operation of the IMO pump.



De Laval IMO Series A322A, a positive displacement, rotary screw type pump, can handle capacities to 750 gpm and pressures to 150 psig.

Catalog LS gives useful application and specification data on the IMO pump. An article titled, *Rotary Pumps, Basic Considerations in Their Application,* contains a description of rotary pumps in general. For these publications, write on your company letterhead to De Laval Steam Turbine Company, 871 Nottingham Way, Trenton 2, New Jersey. DL-301

Rotary Pumps
DE LAVAL
IMO PUMPS

TRADE FRICK MARK®

Unit Air Conditioners

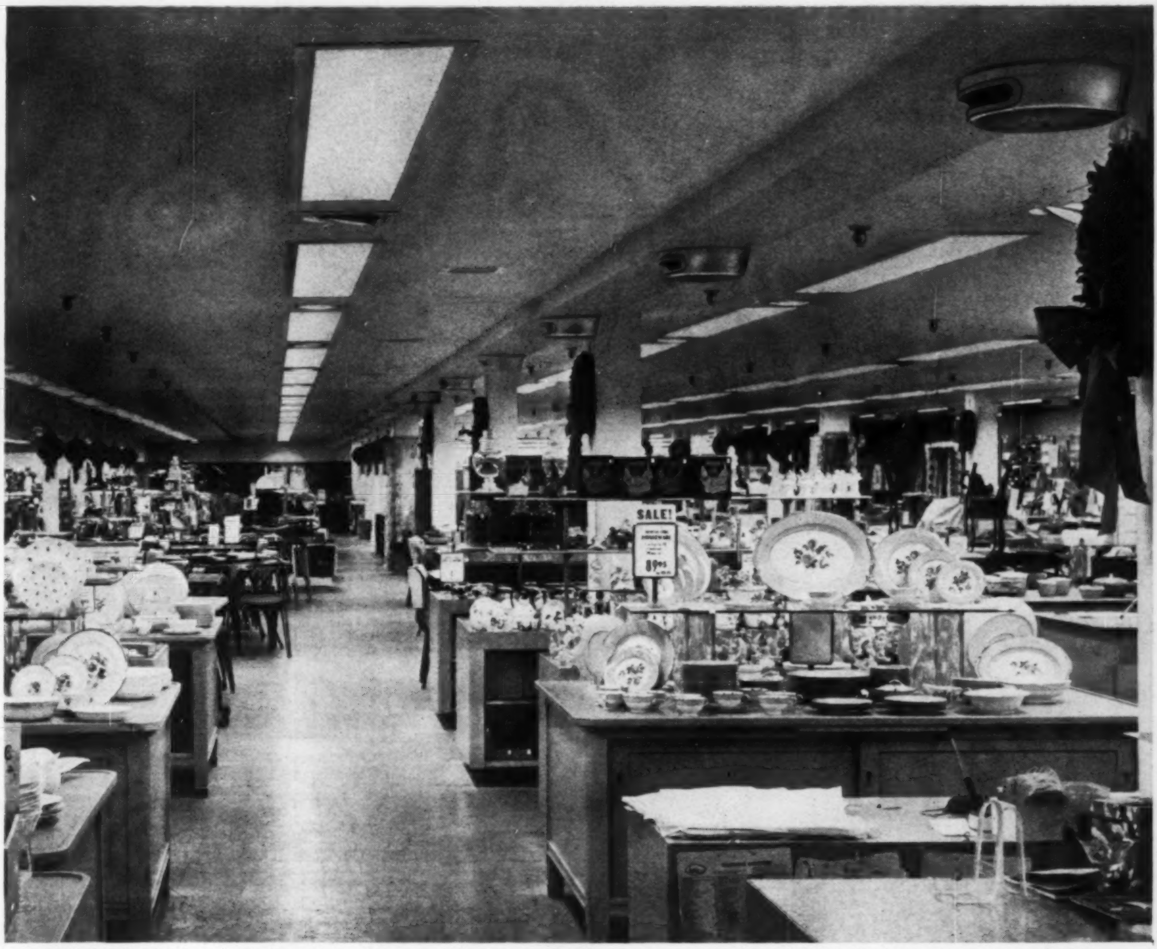
Serve this busy store, as well as restaurants, hotels, offices, factories and many other businesses, everywhere. Note how neatly the conditioner was adapted to the layout of the store through ductwork: this is typical of the complete engineering service you get with Frick equipment.

Frick air conditioners have many advantages . . . larger cooling surfaces . . . insulated condensers . . . self-cleaning filters . . .heavier,quieter construction . . . three sizes . . . backed by over 70 years' refrigeration experience.

Get full details on other important features from Frick Bulletin 522. Some good territories open for qualified distributors. Write, wire, phone or visit

Frick Unit Conditioners are built in 3, 5 and 7½ horsepower sizes. The largest is illustrated. Finish is a beautiful Hammermatic mottled blue-grey.

DEPENDABLE REFRIGERATION SINCE 1882
FRICK Co.
WAYNESBORO, PENNA. U.S.A.



NO LOSS of sales reported when Hess Brothers, Allentown, Pa., department store, installed this high pressure air conditioning system on its three upper floors. Linked with system already in use on lower floors, it points up the advantages of . . .

Kno-Draft High Pressure Air Diffusers

A neat solution to air conditioning a department store without disrupting sales was worked out by Carrier Corporation engineers for Hess Brothers, Allentown, Pa.

Key elements in the installation are Kno-Draft High Pressure Air Diffusers. These permit use of smaller than ordinary ducts, yet provide *draftless* air distribution and equalized temperature throughout the area. Built-in sound baffles assure quiet air delivery.

Installation was done in quarter sections on each floor simultaneously. Thus, only minimum rearrangement of selling space was necessary.

Dropped ceilings cover half the depth of ducts, giving them a shallow beam appearance. The Kno-Draft High Pressure Air Diffusers themselves are easily and quickly attached to the ducts.

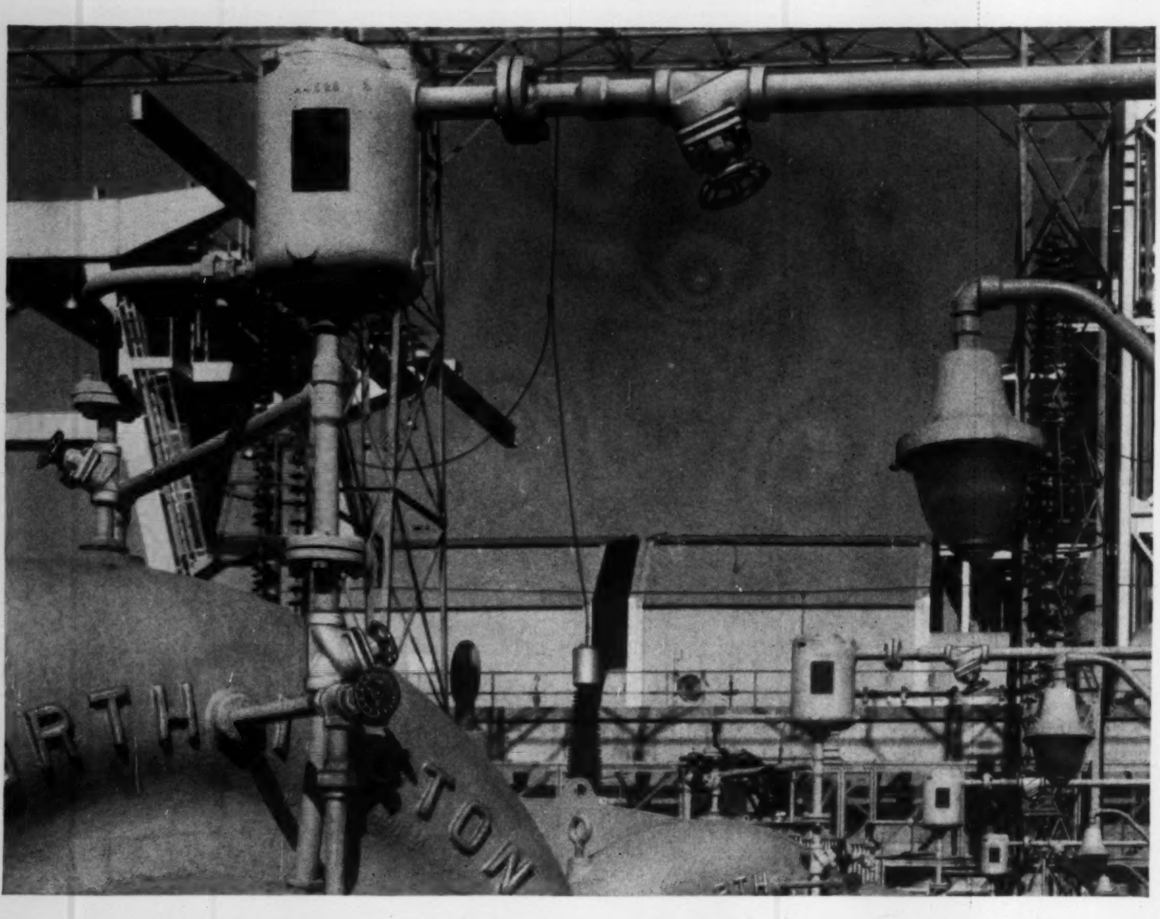
Kno-Draft High Pressure Air Diffusion is one of the newest and most efficient methods of air conditioning. Connor engineers have prepared an authoritative 48-page textbook on the subject. Write on your letterhead for a copy of Bulletin K-33. Connor Engineering Corporation, Dept. G-55, Danbury, Connecticut.

see our catalog in
ARCHITECTURAL FILE
or write for copy

CONNOR

kno·draft®

high pressure air diffusers



Corrosive circulating water tamed here by these CRANE VALVES

THE CASE HISTORY—Almost 2 years' operation without any maintenance of valves on circulating water lines to condensers, and on priming and instrumentation systems—with no trouble in sight. That's the experience of Southern California Edison Company's 280,000 k.w. steam station at Etiwanda with Crane Packless Diaphragm Valves.

The plant's engineers knew that sediment in recirculated water would quickly cut out the seats in ordinary valves and its corrosive elements would attack working parts to make valve operation difficult.

Not so with Crane Packless Diaphragm Valves. Their sealed bonnet keeps working parts out of contact with line fluid—free of corrosive effects. Separate disc construction with pliable insert resists erosion—seats tightly even on foreign particles. Large or small, these valves operate easily with fewer turns to the cycle. Typical Crane quality throughout—they're made better to do the job better—a bigger value for the thrifty buyer.

CRANE No. 1610 PACKLESS DIAPHRAGM VALVES

No packing to maintain. Neoprene diaphragm has longer life because it seals the bonnet only—is not subject to the cutting and crushing encountered when also required to do the seating. Separate disc gives control of fluid even should diaphragm fail. Wide selection of materials and sizes. Write for folder AD-1942 or see your Crane Representative.

CRANE
150 WOG

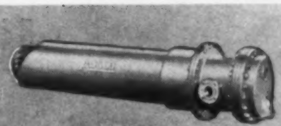
for the
THRIFTY BUYER

CRANE CO.

General Offices: 836 S. Michigan Ave., Chicago 5, Illinois
Branches and Wholesalers Serving All Industrial Areas

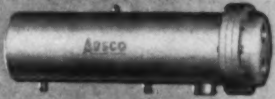
VALVES • FITTINGS • PIPE • KITCHENS • PLUMBING • HEATING

CRANE'S FIRST CENTURY . . . 1855-1955



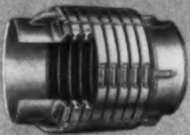
SUCTION OIL HEATERS

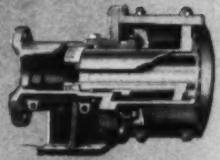
Compact, economical heaters. For use instead of pipe coils in bottom of tank. Only oil to be pumped is heated. Furnished with nozzle for welding to tank or with flange for bolting. Bulletin No. 54-79.



FUEL OIL PREHEATERS

Heating of fuel oil prepares it properly for complete combustion in the burner. Work done by a good preheater, such as ADSCO Type "P", permits the use of heavier grade, less costly fuel oil. Bulletin No. 54-79-1.





EXPANSION JOINTS

ADSCO Corruflex Packless Expansion Joints require no maintenance and cost less than pipe bends. Sizes to 54". For pressures to 300 psi. and higher, temperatures to 1600 F. Various designs for special purposes. Slip-type joints offer long traverses with rigidly guided slips. Bulletin Nos. 35-51A and 54-10.

ADSCO

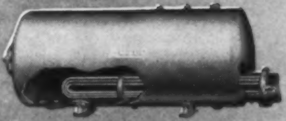
for complete heating and piping service

PIPE LINE ACCESSORIES

Pipe alignment guides insure straight movement of pipe into expansion joint. Pipe anchors, for underground pipe lines, withstand full thrust of piping. Bulletin No. 35-70H.

INSTANTANEOUS WATER HEATERS

Furnished as either steam tube or water tube type. Of simple U-bend design with removable element. For heating domestic or process water. Also used as a convertor for space heating. Bulletin Nos. 54-77A and 54-78A.



STORAGE WATER HEATERS

Wide choice of tank materials, including non-corrosive metals, or phenolic-resin lined steel. Welded construction in vertical or horizontal types. Removable U-tube element. Built to Code requirements. Bulletin No. 54-75B.

AMERICAN DISTRICT STEAM DIVISION
ADSCO INDUSTRIES, INC.
NORTH TONAWANDA, NEW YORK
PLANTS: NORTH TONAWANDA, N. Y. — RICHMOND, CALIF.

ADSCO
ENGINEERED
PRODUCTS

Avoid struggling starts and overloaded circuits...

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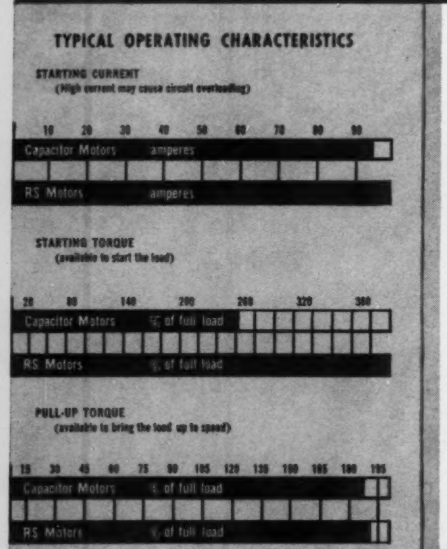
Century

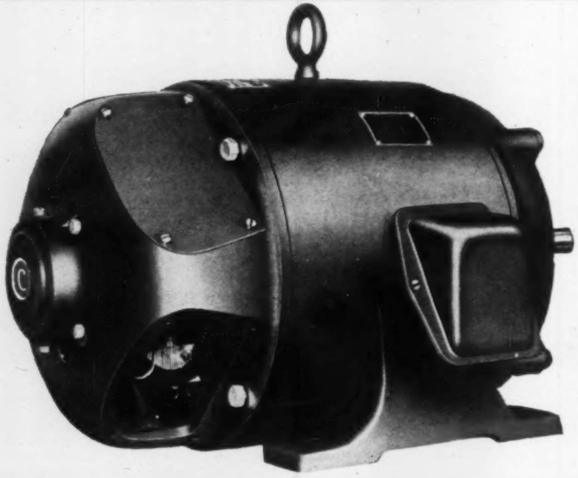
SINGLE-PHASE MOTOR Performance-Rated© FOR YOUR JOB

Capacitor Motors . . . ⅛ to 20 H.P. provide high starting torque, very high pull-up torque and require normal starting current. They are available in drip proof, splash proof, dust proof and explosion proof enclosures.

Even if you have severe starting current limitations, you can select the torque you need for sure starts and smooth pull-up to speed from the Century Performance-Rated Single-phase line. In addition, Performance-Rating also allows you to select the size, speed, mounting and enclosure to fit your application.

Whatever Your Motor Job . . . there's a Century Motor Performance-Rated to handle it with top effectiveness. Contact your nearby Century branch office or Authorized Distributor.


TYPICAL OPERATING CHARACTERISTICS



Repulsion Start, Induction Motors (type RS) . . . from ½ to 7½ H.P. provide very high starting and pull-up torque, yet require unusually low starting current. They are available in drip proof and splash proof enclosures.

Performance-Rated© Motors ⅛ to 400 H.P.

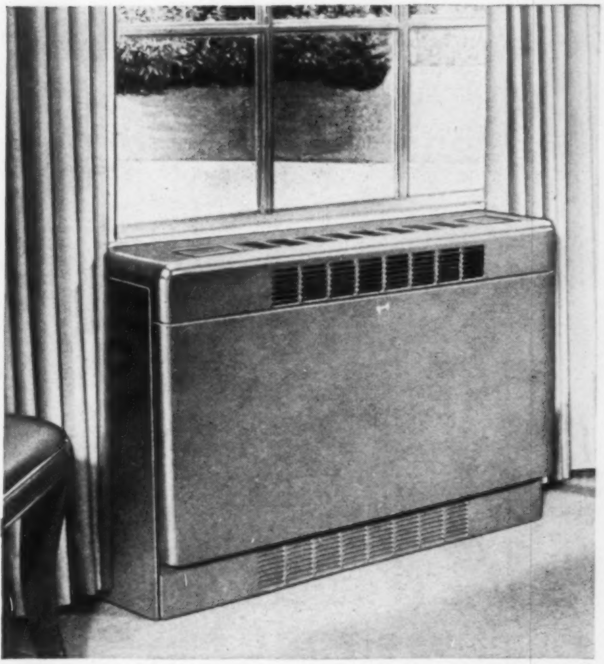
CENTURY ELECTRIC COMPANY

1806 Pine Street, St. Louis 3, Missouri • *Offices and Stock Points in Principal Cities*

Four Season

AIR CONDITIONING

in one compact unit...



new

"ROOMAIRE" CONDITIONER by Young

for HOSPITALS, HOTELS, MOTELS,
SCHOOLS, APARTMENTS, HOMES

"Roomaire" Conditioners can be installed either free-standing or partially recessed.

"Roomaire" Conditioners provide four season air conditioning in one compact, individually controlled unit. They cool, dehumidify, heat, ventilate, filter and circulate, operating with hot water in winter and chilled water in summer . . . using *the same piping.*

"Roomaire" units are ideal for installation in hotels, hospitals, motels, schools, apartments, homes and public buildings where individual room conditioning is desirable. Only 9¼" in depth, the "Roomaire" Conditioner requires a minimum amount of floor space, and it can be partially recessed if desired.

The functional design of the "Roomaire" unit provides efficient air distribution through grilles at the top and front of the cabinet. Recirculated air is drawn through a return air grille at the bottom of the unit and fresh air can be admitted through a dampered opening in the back of the unit (optional). All air passing into the unit is filtered through permanent, cleanable type filters. Component parts are completely accessible with removal of the front panel.

"Roomaire" Conditioners are available in three sizes, 200, 400 and 600 cfm with nominal cooling capacities of ½, 1 and 1½ tons to meet every room conditioning requirement. For complete details on "Roomaire" Conditioners see your nearest Young Representative listed in the yellow pages of your telephone directory or fill in the coupon and mail it to the Young Radiator Company, Racine, Wisconsin.

FOR MORE DETAILS MAIL COUPON TODAY

Young RADIATOR COMPANY
RACINE, WISCONSIN

Creative HEAT TRANSFER ENGINEERS FOR INDUSTRY

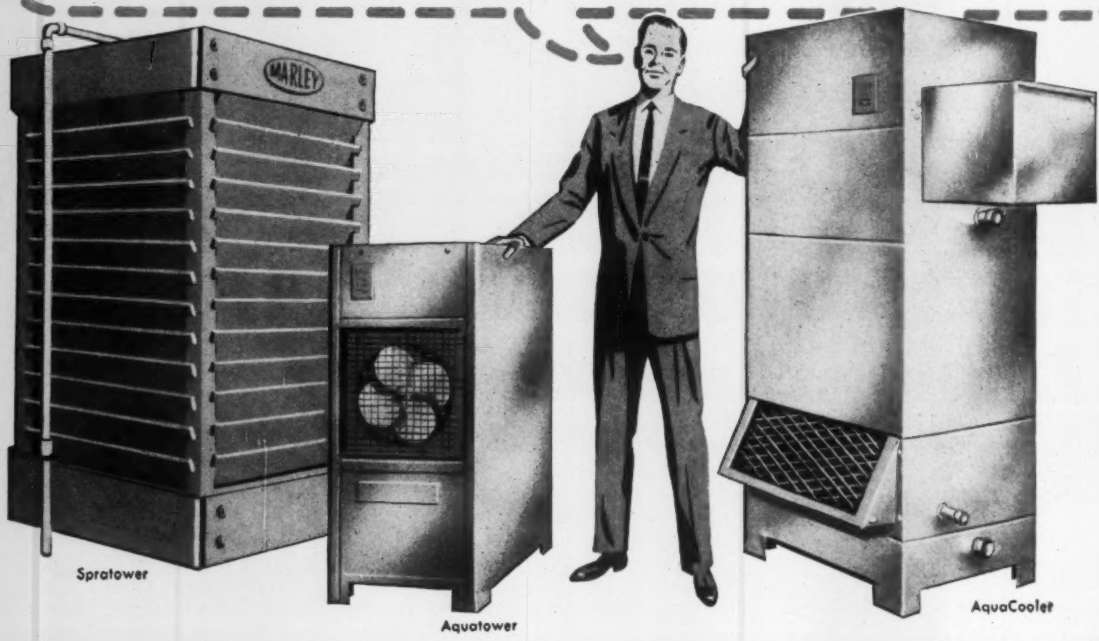
Heat Transfer Products for Automotive, Aviation and Industrial Applications.
Heating, Cooling, Air Conditioning Products for Home and Industry.

Executive Office: Racine, Wisconsin, Plants at Racine, Wisconsin, Mattoon, Illinois

YOUNG RADIATOR COMPANY
Dept. 515-E, Racine, Wisconsin
Please send me your free Catalog No. 7754 completely describing "Roomaire" Conditioners by Young.

Name..
Position..
Company...
Address..
City.......................................State..............

"MARLEY Cooling Towers
are Professional Products
sold only
through professional channels"



No doubt about it—from the standpoint of engineering, Marley cooling towers are "tops". And to make sure that the ultimate user receives all the benefits of this excellent engineering, Marley distributes its towers only through professional channels.

Selecting, sizing, installing and servicing cooling towers are all jobs that require technical training, skill and know-how. That is why Marley cooling towers reach the user only through you—the air conditioning engineer and contractor; that is why they are installed and serviced only by your experienced mechanics.

Marley does more than any other manufacturer to help you select, install and service cooling towers. Marley products are engineered for the easiest possible installation. Marley Sales Engineers (all technically trained specialists) in 55 cities are always available for advice and assistance. The company provides complete technical manuals on every Marley tower.

For further assistance, Marley publishes "Packaged Cooling Tower Know-How", a comprehensive brochure on installation that tells and shows how-to-do-it, as well as when, where and why. Write today for your free copy on your company's letterhead.

MARLEY

The Marley Company

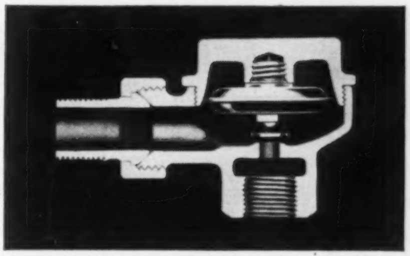
Kansas City, Missouri

See for yourself why you don't replace seats in Dunham Traps

A glance at this photograph quickly tells the entire story. Dunham's flat valve disc closes *flush* against the trap seat. Since Dunham's flat disc does not fit *into* the seat . . . isn't tapered or conical . . . there's less chance for erosion, wear or wire-drawing.

Dunham Radiator Traps always assure easy passage of air, water and foreign matter. No clogging. Extra-large, non-clogging seat opening is unrestricted by any guide. There are no bellows to stick, no field adjustments to make.

Steam Specialties are our specialty . . . and have been since we perfected the first commercially successful thermostatic trap over 50 years ago. Next time you need anything at all in the steam specialties line, do as so many have done for so long—*Depend on Dunham for all your needs.*



Dunham Radiator Trap
3 sizes: 5 patterns; to 700 EDR

DUNHAM HEATING & COOLING EQUIPMENT

RADIATION • CONTROLS • UNIT HEATERS • PUMPS • SPECIALTIES
QUALITY FIRST FOR OVER FIFTY YEARS
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MOTORS

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LIMA

IN NEW NEMA
FRAME SIZES

A New Approach to Perfection

- MORE POWER
- BETTER PROTECTION
- SMALLER SIZE
- LIGHTER WEIGHT

For complete information . . . See your local Lima Representative listed in Thomas' Register, MacRae's Blue Book, Conover-Mast Purchasing Directory, or write—

Of course, the former NEMA frame sizes 66 to 505 (1/3 to 150 H.P.), incorporating the latest advances in motor design, will remain in production.

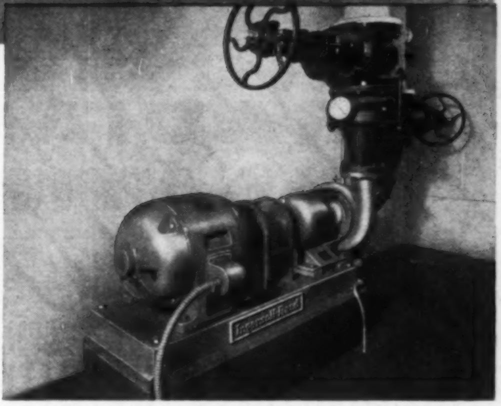
LIMA

THE LIMA ELECTRIC MOTOR COMPANY 4989 Findlay Road Lima, Ohio
Representation throughout the U.S., Canada and abroad

FIRST . . . FOR MOTORS . . . DRIVES . . . GRINDERS

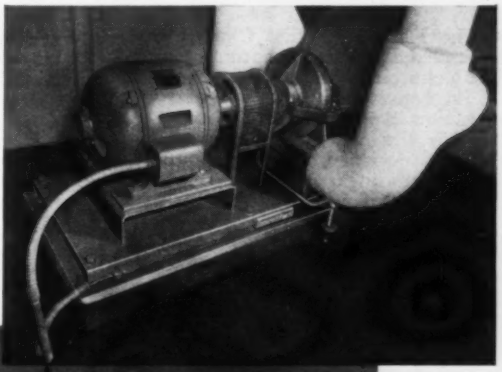
The Stearns-Roger Building, home office of the firm at Denver, Colorado, designed, engineered, and constructed by Stearns-Roger with Mr. J. Roger Musick as consulting architect.

Air Conditioning in the mile high city . . .



An Ingersoll-Rand Class 4CRVL 20 horsepower cradle-mounted pump on cold water circulation service. Delivery 860 gpm—head 55 feet.

An Ingersoll-Rand Class 4DMV 20 horsepower horizontally-split pump on cold water circulation service. Delivery 610 gpm—head 85 feet.



and Ingersoll-Rand Centrifugal Pumps play their part . . .

Installations such as this are becoming the rule rather than the exception these days. Even in the cooler areas of the country, office buildings, theatres, shopping centers, restaurants, hotels, hospitals, etc. are catering to the comfort of their employees and customers with central system air conditioning.

Ingersoll-Rand Centrifugal Pumps from ¼ horsepower up are ideal for cooling tower or chilled water service anywhere. These dependable pumps help give indoor comfort day in and day out with minimum maintenance and maximum efficiency.

When you are working on an air conditioning job check Ingersoll-Rand Circulating Pumps to do a bonus job for you. In the meantime, write for full information on I-R pumps for air conditioning service. Remember, the job is never too small nor too large for the Ingersoll-Rand Line.

Ingersoll-Rand
9-165 11 Broadway, New York 4, N. Y.

RADIANT
HEATING

the ultimate in efficiency where budgets control the building plans

• The First Methodist Church of Plainfield, Iowa, had to be more than just a church to warrant the expense of its construction. Consequently, architects Schweikher & Elting, although limited by a budget of $67,000, designed this remarkably flexible building for the local population of 1300. It includes:

- **A church assembly room for 140 worshippers.**
- **A social hall with stage that will seat up to 90 people.**
- **A 350-sq. ft. kitchen to serve the social hall.**
- **Four distinct classrooms with sliding walls. Will seat 70 persons.**
- **All the storage, office and service space required of a small community building.**
- **A complete radiant heating system of USS NATIONAL Steel Pipe.**

In such installations where efficiency is the key word, there is no better choice of materials to be made than NATIONAL Pipe—dependability at a moderate price. So dependable that architects and contractors have been specifying it for over 60 years as the "standard" for conventional plumbing and heating systems. They know that NATIONAL Steel Pipe has the inherent characteristics necessary to meet the requirements of such applications—smooth, uniform bending; sound, strong welding properties; and long service life—characteristics that have made it the largest selling pipe in the world.

For further information on the application of USS NATIONAL Steel Pipe to radiant heating and snow melting services, write:

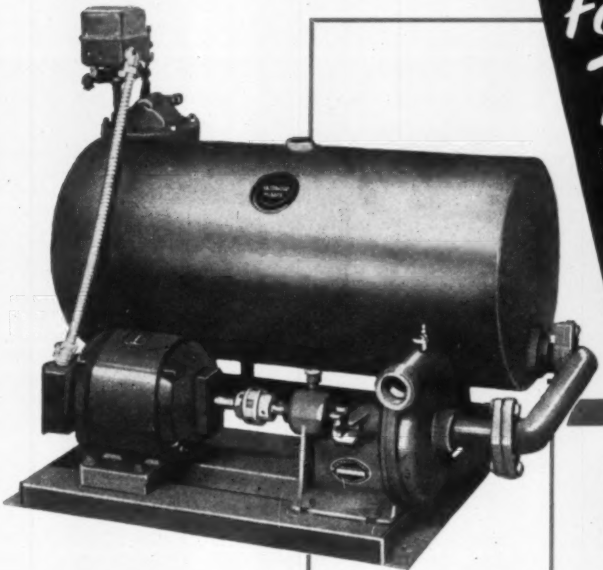
NATIONAL TUBE DIVISION
UNITED STATES STEEL CORPORATION
PITTSBURGH, PA.
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
PACIFIC COAST DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS

USS NATIONAL Steel PIPE

UNITED STATES STEEL

For
Top Economy
-SKIDMORE
HAS NO EQUAL!



"HS"

CONDENSATE PUMP

Furnished in single or duplex units.

Cost less to install!
Cost less to operate!

Here's a condensate pump that spells savings for you all along the line . . . from the very start — its installation costs less . . . and year after year of efficient service its operating cost, is still less, than comparable pumps.

The performance and dependability of the popular Skidmore "HS" Pump is well reflected in the hundreds of installations throughout the country. The type HS Pump is designed to operate at a wide range of pressures — including operation at high temperature encountered in condensation pump service. Pump consists of horizontal unit with motor, receiver and float switch, mounted on flat base. Pump can be disassembled without disturbing piping connections.

SEND FOR YOUR COPY

Complete engineering data and capacity tables are yours for the asking. Be sure and send for Bulletin No. 14-A.

Skidmore Pumps

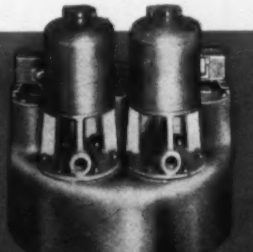
SKIDMORE IS SYNONYMOUS WITH QUALITY AND ENGINEERING LEADERSHIP SINCE 1921

SKIDMORE
PUMPS

SKIDMORE CORPORATION
ST. JOSEPH, MICHIGAN

TYPE "BV"

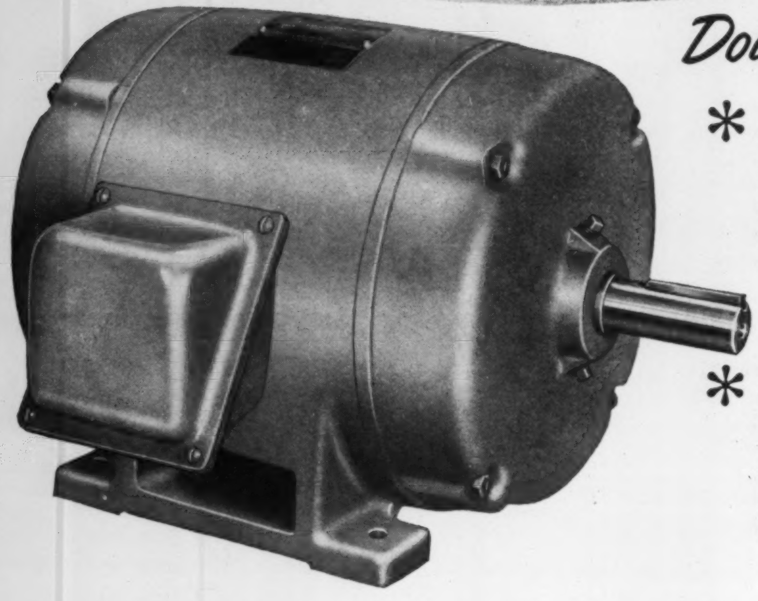
TYPE "HS"


TYPE "CV" DUPLEX

Wagner®
ELECTRIC MOTORS
... the choice of leaders in industry

NEW!
Wagner Type *DP** Motors

Doubly Protected



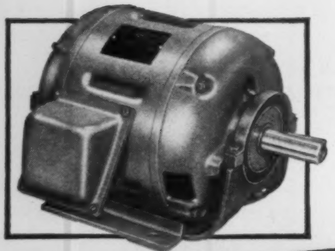
* Wagner Type DP Motors are protected by rugged, corrosion-resistant cast iron frames, smoothly rounded so that no moisture can collect on them. Motor feet are cast as an integral part of the frame for maximum strength and rigidity.

* Enclosures are drip-proof plus! Air intakes are located at the bottom of the endplates — air outlets are located at the base of the frame, one on each side. Specially designed baffles provide protection for the stator windings.

The Wagner line of polyphase, drip-proof general purpose motors—rerated to the new NEMA Standards—pack more power into smaller frames, but give you the same high Wagner Quality and long life performance that have made Wagner Motors "the choice of leaders in industry" for many, many years. These new Wagner Motors are fully protected in the ball bearing models. Their construction makes them completely drip-proof — and virtually splash-proof. The extra large, diagonally split conduit box makes wiring easy. Smaller size and lighter weight means more economical handling and installation.

These new rerated Wagner Motors retain the features desired by plant engineers and maintenance men. They will operate for years without regreasing. But . . . when lubrication *is* necessary or desirable, you *can* lubricate these motors because they are provided with two lubrication openings.

Bulletin MU-202 gives full information—write for your copy today.



AVAILABLE WITH RESILIENT MOUNTING —SLEEVE BEARINGS UP THROUGH 5 HP.

These Wagner standard motors, in ratings up through 5 horsepower, can be used for specialized applications because they are available in sleeve bearing models with endplates that will take resilient mounts.

You can look to Wagner for a complete line of standard motors for specialized applications. The wide range of types and sizes permit the selection of a standard motor for almost any need.

Wagner Electric Corporation
EST. 1891

Wagner Electric Corporation
6370 Plymouth Ave., St. Louis 14, Mo., U. S. A.

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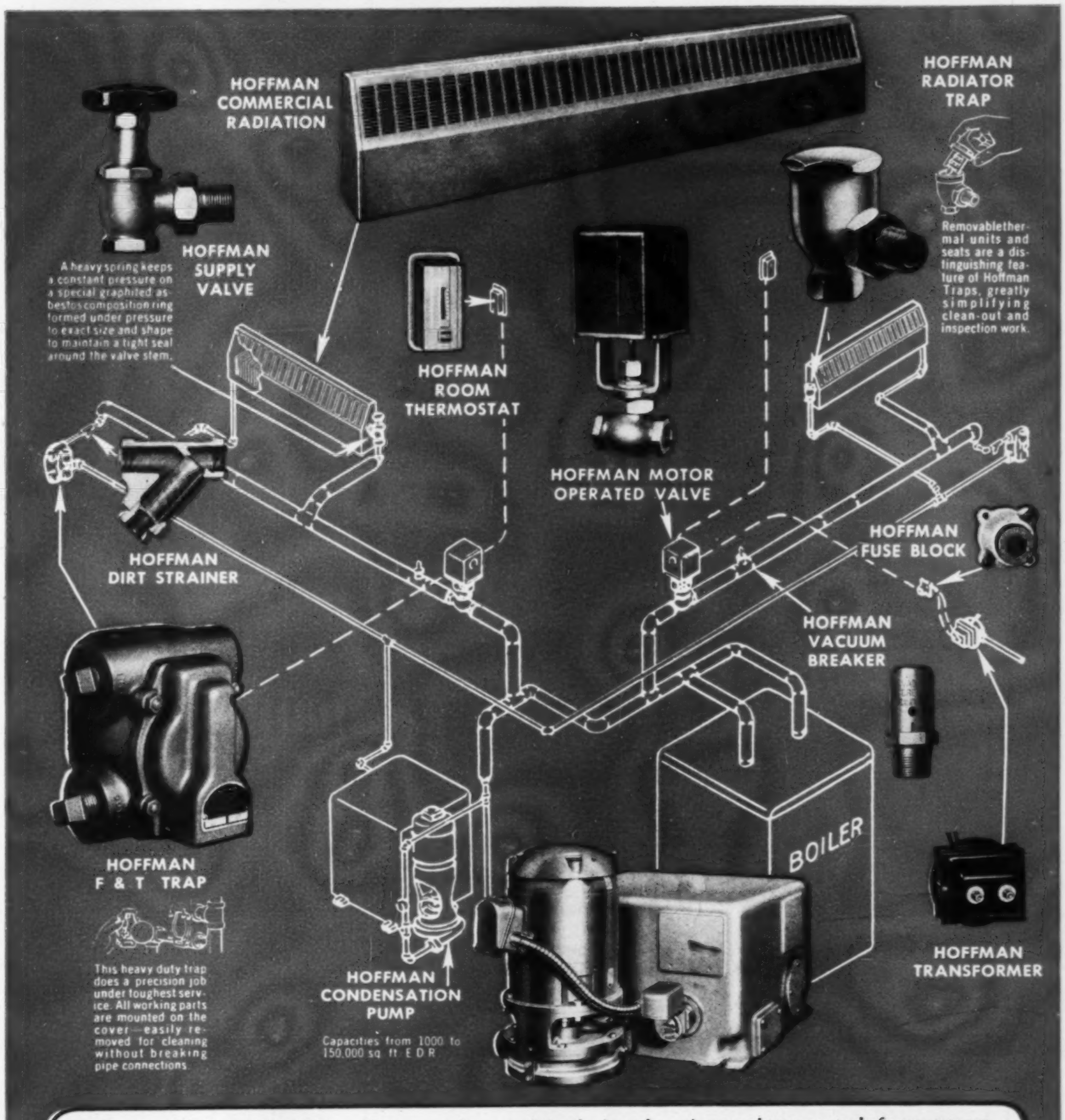
M55-6

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES • AUTOMOTIVE BRAKE SYSTEMS–AIR AND HYDRAULIC

HOFFMAN COMPLETE LINE

OF *STEAM SYSTEM CONTROLS*


HOFFMAN COMMERCIAL RADIATION
HOFFMAN RADIATOR TRAP
HOFFMAN SUPPLY VALVE
HOFFMAN ROOM THERMOSTAT
HOFFMAN MOTOR OPERATED VALVE
HOFFMAN FUSE BLOCK
HOFFMAN DIRT STRAINER
HOFFMAN VACUUM BREAKER
BOILER
HOFFMAN F & T TRAP
HOFFMAN CONDENSATION PUMP
HOFFMAN TRANSFORMER

A heavy spring keeps a constant pressure on a special graphited asbestos composition ring formed under pressure to exact size and shape to maintain a tight seal around the valve stem.

Removable thermal units and seats are a distinguishing feature of Hoffman Traps, greatly simplifying clean-out and inspection work.

This heavy duty trap does a precision job under toughest service. All working parts are mounted on the cover—easily removed for cleaning without breaking pipe connections.

Capacities from 1000 to 150,000 sq ft E D R

There's a Hoffman Trap, Valve, Pump or other specialty designed to give you *better control* of every steam system requirement. And, *each* Hoffman product is distinguished by exclusive features that assure customer satisfaction, long, care-free service. *It's the* COMPLETE, *tested, quality line* backed by a dependable, single source of supply and responsibility. *Yet Hoffman Products cost no more than the ordinary kind—and pay their way with the fuel they save.*¶ To avoid delays—order now from your wholesaler of heating and plumbing supplies. Catalogs available on all items.

HOFFMAN SPECIALTY MFG. CORP. • 1700 West 10th Street, Indianapolis 22, Indiana

Makers of Valves, Traps, Hot Water Heating Systems, Vacuum and Condensation Pumps...Sold by Leading Wholesalers of Heating and Plumbing Equipment

HM THE ONLY Matched

COOLING TOWERS and CONDENSERS

The Halstead & Mitchell Cooling Towers you select are *matched* by design to work with the famous Halstead & Mitchell water-cooled Condensers. You need no longer buy a high-efficiency cooling tower to work with a low-efficiency condenser (or *vice-versa*) . . . a long-life cooling tower to work with a short-life condenser (or *vice-versa*).

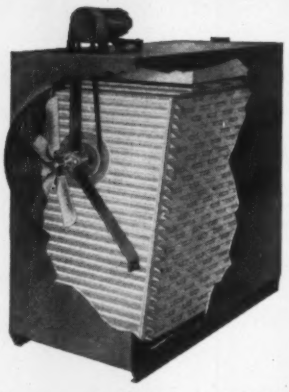
Remember that every cooling tower you sell is planned to work with a water-cooled condenser—then you'll see why America's leading manufacturers of air-conditioning and refrigeration equipment have swung to Halstead & Mitchell for their original equipment needs in both these components.
With cleanability you'll sell more. Why sell less?

20-Year Guarantee!

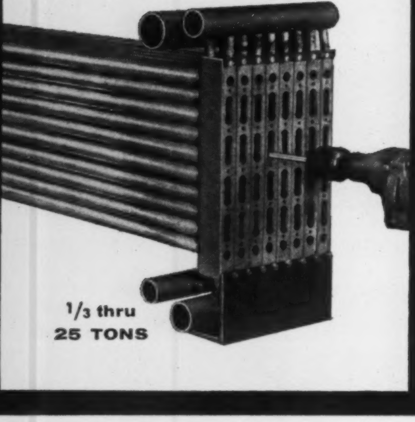
on the wetted deck surface against rotting or fungus attack

Only Halstead & Mitchell pressure-creosoting can provide a *guarantee* against immediate attack by fungus and marine parasites . . . or chemical deterioration from acids in water.

Added to this H&M exclusive are other major advantages. There's ultra-high efficiency in the gravity-type water distributing pan which eliminates extra pumping head required on spray type towers . . . and cuts down on water losses due to "atomizing" of water. And there's extra-long life in stainless steel fans . . . and sheet steel cabinets hydraulically painted with vinsynite, vinyl zinc and chlorinated rubber.



2 thru 120 TONS



1/3 thru 25 TONS

Lifetime Cleanability

The *mechanical* cleaning of H&M double-tube, counter-flow condensers means the simplest, least dangerous method of restoring new unit efficiency. Whether removing a heavy coating of sludge and scale, or a thin insulating film on the inner walls of the copper tubing, the mechanical cleaning tool restores heat transfer efficiency in a matter of minutes. The result is lowered discharge pressures . . . more heat carried off by cooling water . . . lower bills. *Only* the impurities are removed . . . the thickness of the copper wall remains intact, and the condenser gives extra years of peak service.

At Leading Heating and Refrigeration Wholesalers
EVERYWHERE

Write for Detailed Specifications

HM
Halstead & Mitchell

BESSEMER BUILDING • PITTSBURGH 22, PA.

Yes, and make sure you use adequately-sized dependable steel pipe
MODERN LIVING
CALLS FOR
PLENTY of- WATER
PLENTY of- PRESSURE
Buy your Automatic Water System NOW!

●Plenty of water and plenty of pressure are directly dependent on properly sized pipe. So whenever you install an Automatic Water System, be sure to put in dependable steel pipe from street main to furthest faucet, sized not only for today's requirements, but also adequate for the additions and extensions likely to be needed in the future.

Youngstown

STEEL QUALITY YOUNGSTOWN SERVICE **PIPE**

THE YOUNGSTOWN SHEET AND TUBE COMPANY *Manufacturers of Carbon, Alloy and Yoloy Steel*

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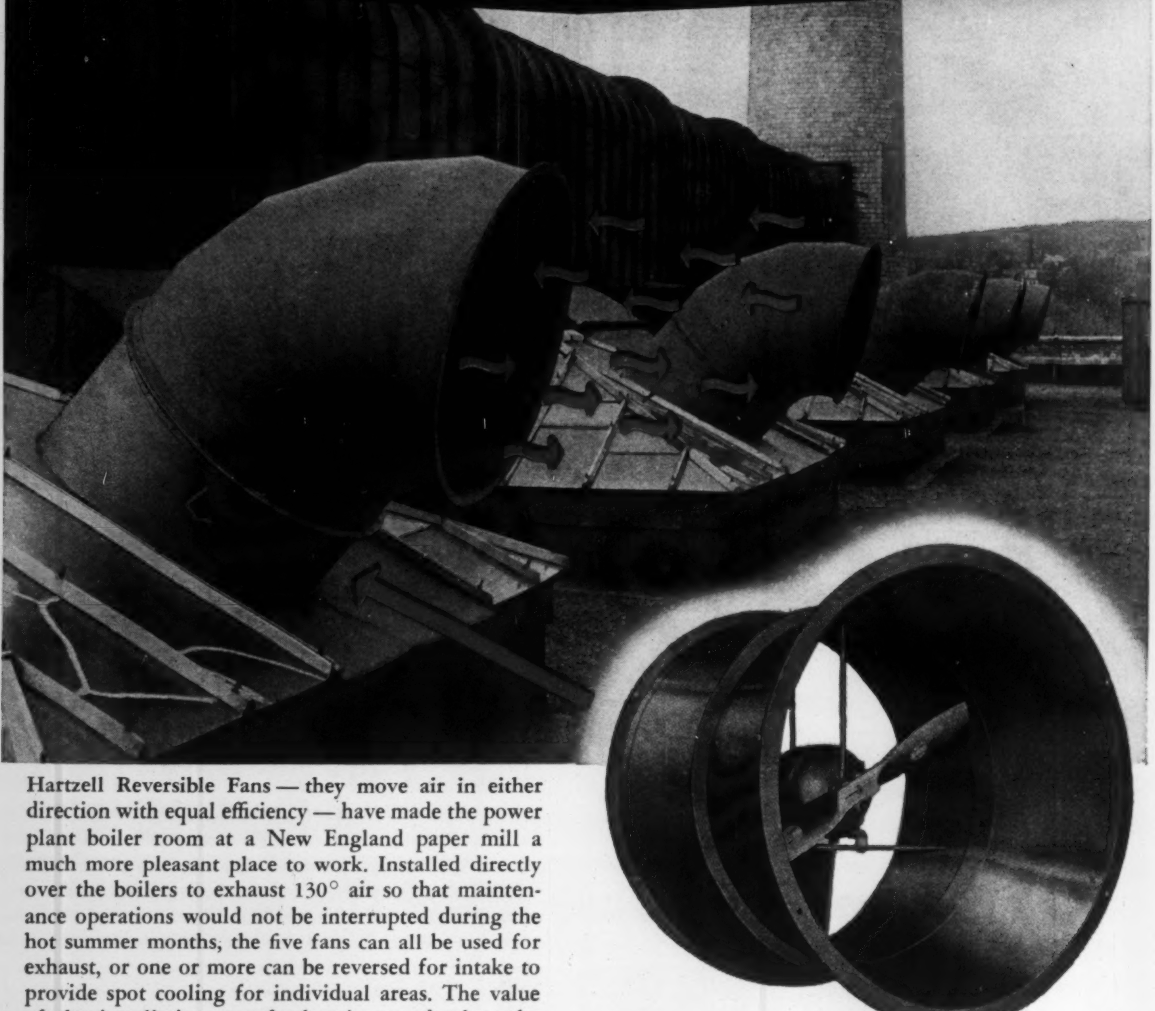
SHEETS - STRIP - PLATES - STANDARD PIPE - LINE PIPE - OIL COUNTRY TUBULAR GOODS - CONDUIT AND EMT - MECHANICAL TUBING - COLD FINISHED BARS - HOT ROLLED BARS - BAR SHAPES - WIRE - HOT ROLLED RODS - COKE TIN PLATE - ELECTROLYTIC TIN PLATE - RAILROAD TRACK SPIKES

Hartzell *Reversible* Fans carry a double burden in the power plant at this New England paper mill



This installation was handled by the Hartzell field office at 4 Einhorn Road, Worchester, Mass., phone 6-2056.

Hartzell Reversible Fans — they move air in either direction with equal efficiency — have made the power plant boiler room at a New England paper mill a much more pleasant place to work. Installed directly over the boilers to exhaust 130° air so that maintenance operations would not be interrupted during the hot summer months, the five fans can all be used for exhaust, or one or more can be reversed for intake to provide spot cooling for individual areas. The value of the installation was further increased when the plant operators began using the same fans as intake units during the winter. In this application, outside air — preheated by blowing over the boiler casings — provided fresh air for the room and additional combustion air for the boilers.

A simple installation, sure. But it took a special fan to make it work—the versatile Hartzell reversible fan. Simple answers to tough industrial air-moving jobs are a Hartzell specialty. Your nearby Hartzell field engineer has the "know-how," and the equipment, to help you solve your toughest ones. Be sure to give him a call the next time you have any air-moving problem.

HARTZELL *propeller fan co.*

Div. of Castle Hills Corp.

Dept. V

PIQUA, OHIO

ENGINEERING OFFICES IN PRINCIPAL CITIES

PROPELLER-TYPE FANS • BLOWERS
ROOF VENTILATORS • UNIT HEATERS

Modine announces
a new convector line

designed and priced for every application!

MODINE . . . recognized leader in convector design . . . now offers the broadest line available. There are 30 types, 8000 sizes . . . a convector for every application.

Superlatively styled . . . yet budget-priced . . . this beautiful new convector line is quality-built in every detail. It's the result of over 25 years of convector manufacture, skilled craftsmanship and experienced convector engineering . . . plus entirely new production facilities at the Modine Racine (Wis.) plant.

Before you specify or buy convectors be sure to find out about the new Modine line. For complete details, call the Modine representative listed in the classified section of your phone book or write Modine Manufacturing Co., 1509 DeKoven Ave., Racine, Wis.

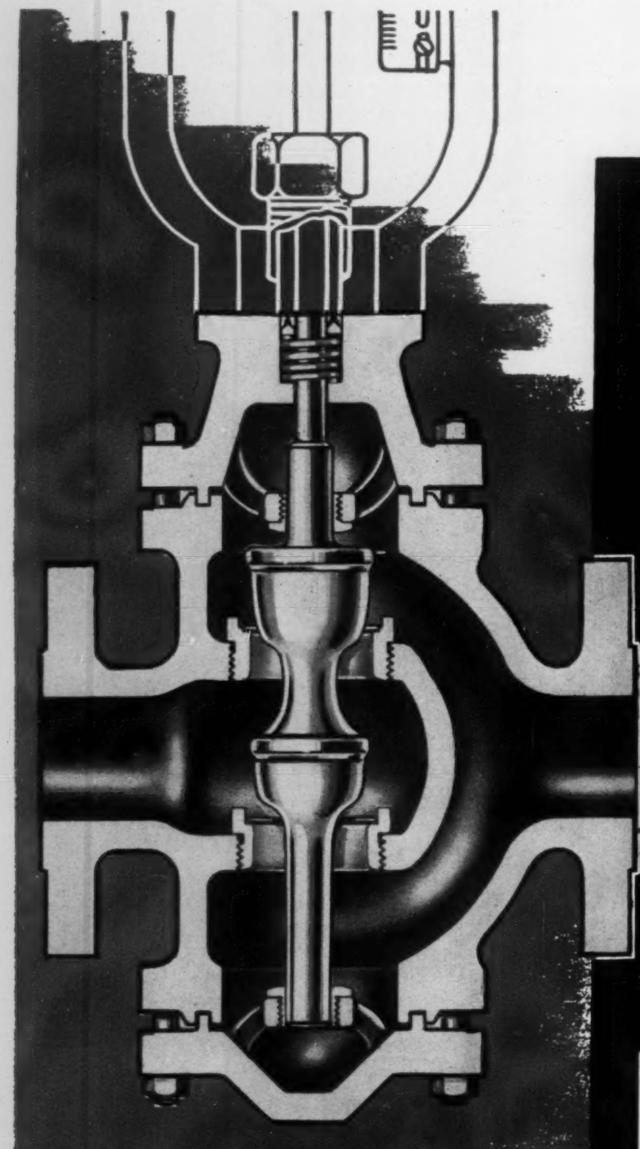
30 types • 8000 sizes

There's a Modine Convector to meet your exact needs: Deluxe, standard and institutional models — free-standing, fully and partially recessed, concealed and wall-hung types with many design variations.

Modine

CONVECTOR RADIATION

R-1256



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IS THE VALVE MANUFACTURER THAT LAPS THE SEATS OF DOUBLE PORTED VALVE BODIES AT OPERATING TEMPERATURES

Fisher valve being steam heated to specified operating temperature.

Inner valve being "ground in" while assembly is hot.

Insures superior control with tighter shut-off on high temperature service.

Both upper and lower seating surfaces contact simultaneously at specified operating temperatures.

FISHER

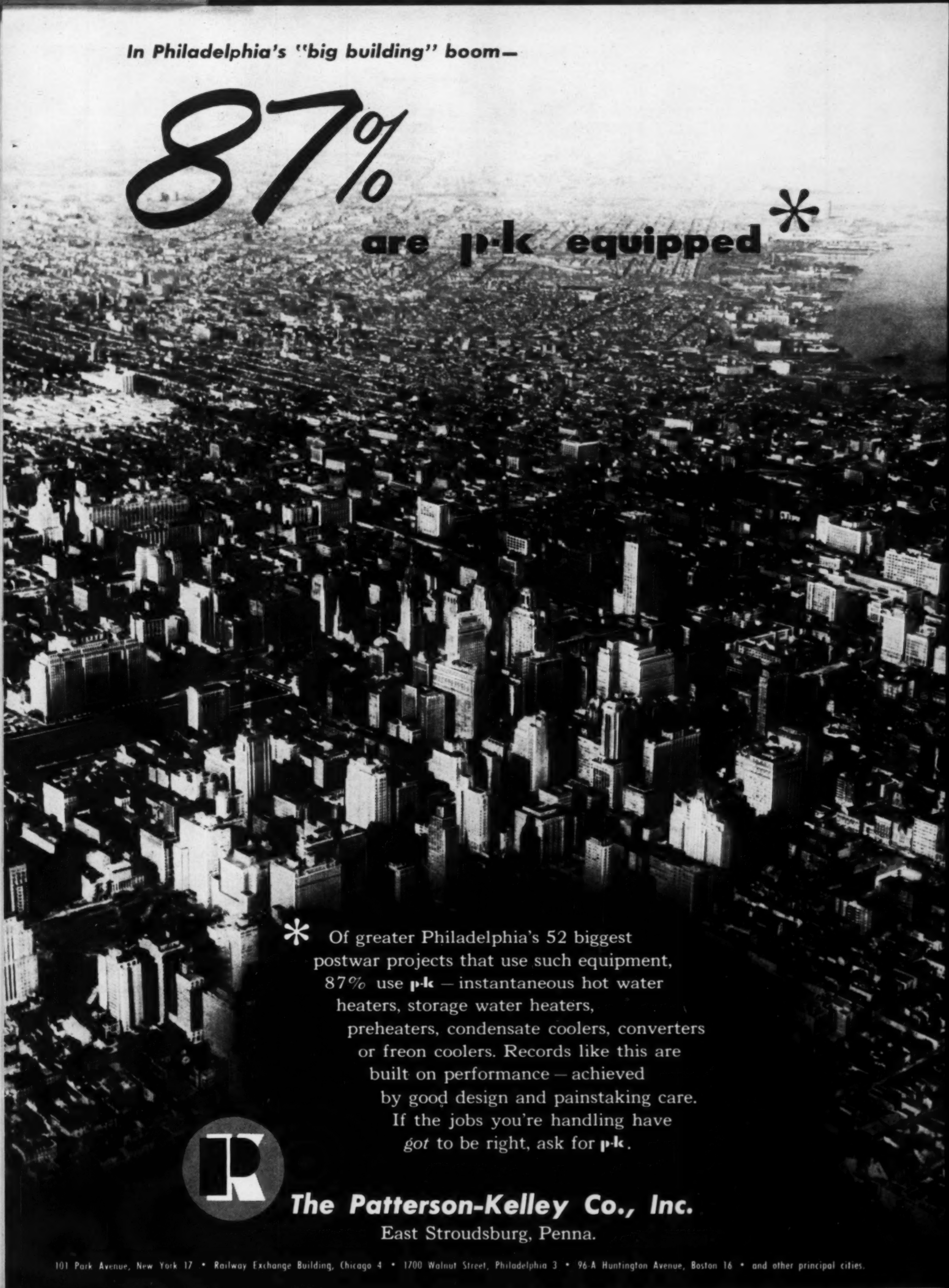
Our 75th ANNIVERSARY

FISHER GOVERNOR COMPANY • MARSHALLTOWN, IOWA
WORLD LEADER IN RESEARCH FOR BETTER PRESSURE AND LIQUID LEVEL CONTROL

In Philadelphia's "big building" boom—

87%

are p·k equipped*



* Of greater Philadelphia's 52 biggest postwar projects that use such equipment, 87% use p·k — instantaneous hot water heaters, storage water heaters, preheaters, condensate coolers, converters or freon coolers. Records like this are built on performance — achieved by good design and painstaking care. If the jobs you're handling have *got* to be right, ask for p·k.

The Patterson-Kelley Co., Inc.
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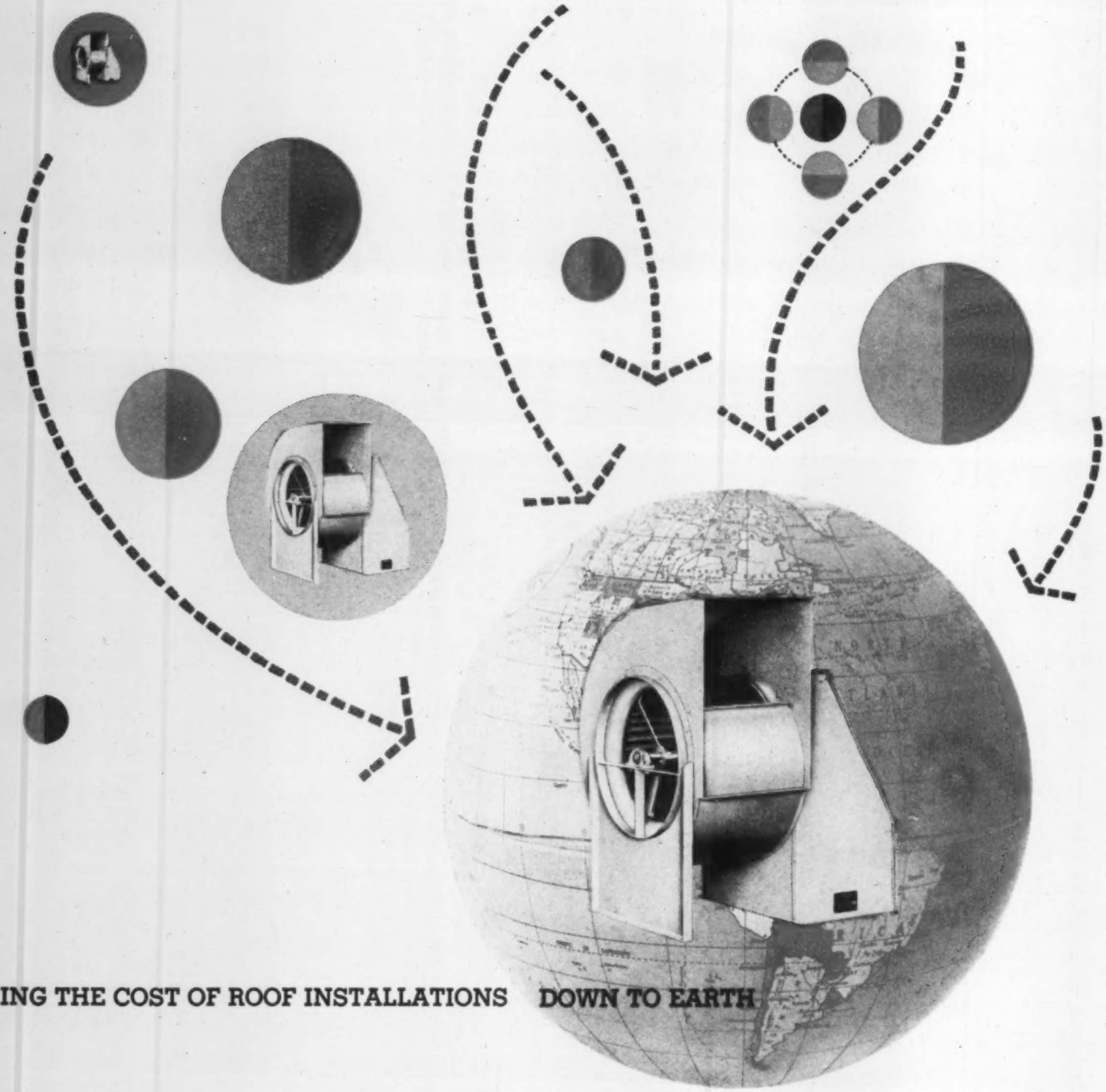

BRING THE COST OF ROOF INSTALLATIONS DOWN TO EARTH

Utility's new blowers with weatherproof enclosures for motors and drives eliminate sky-high roof installation costs and weather-wear. These high-quality units insure a long life and a low amortized cost.

Because a roof installation becomes the "forgotten fan," it frequently breaks down from lubrication neglect. Utility has made sure this can't happen — all sizes feature permanently sealed, pre-greased ball bearings. They're forever impervious to dirt, moisture, and drastic temperature changes and require no further lubrication.

Manufacturers of heavy and standard duty blowers for heating, air conditioning and ventilating installations. Producers of blowers and blower parts for original equipment manufacturers. Write for catalogue data.

UTILITY FAN CORPORATION 911 East 59th Street, Los Angeles 1, California

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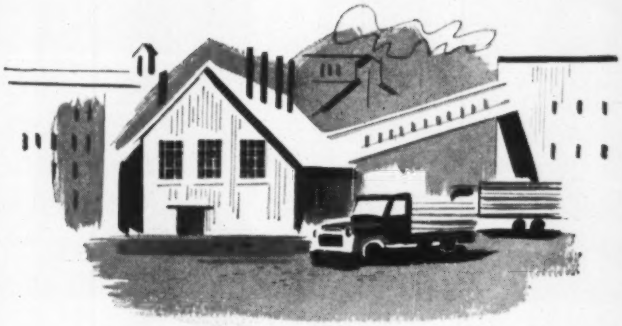


WEIRTON

GALVANIZED SHEETS

for long-lived roofing and siding

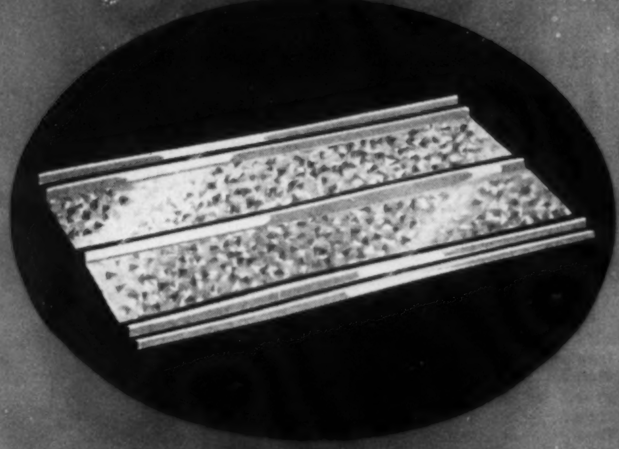
There's an easy way to solve roofing and siding problems quickly, dependably, economically. That's the Weirton way—with Weirton galvanized steel sheets. Their tight zinc coating resists cracking, peeling and flaking. The strength of steel plus the corrosion resistance of zinc gives added years of life. And long experience shows that galvanized sheets give more protection, with less maintenance and at lower cost.

Weirton's modern production processes, plus close quality control all along the line, make Weirton galvanized sheets a best buy for your roofing and siding needs.

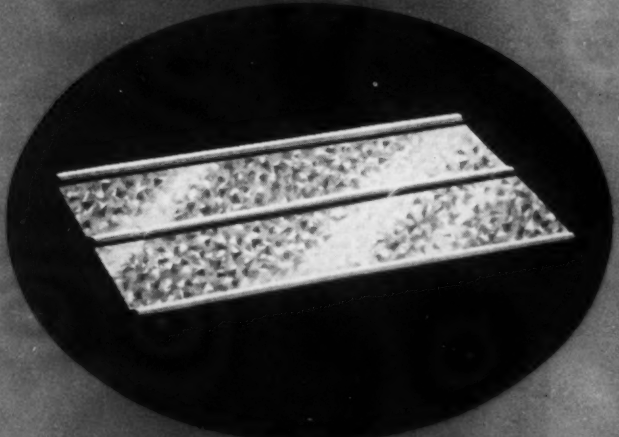
WEIRTON STEEL COMPANY

WEIRTON STEEL COMPANY
Weirton, West Virginia

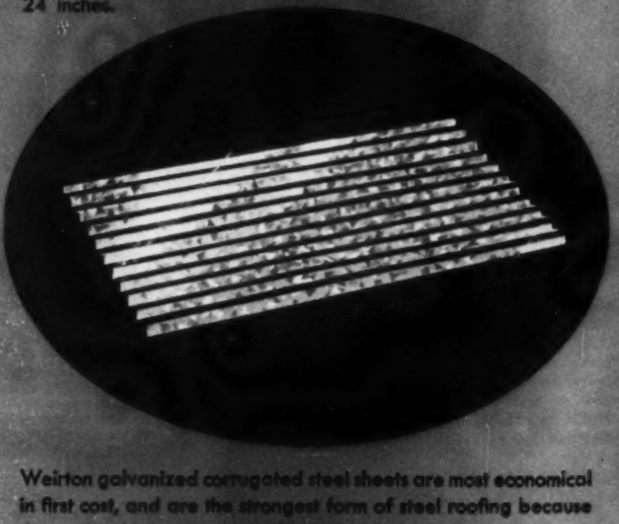
NATIONAL STEEL CORPORATION



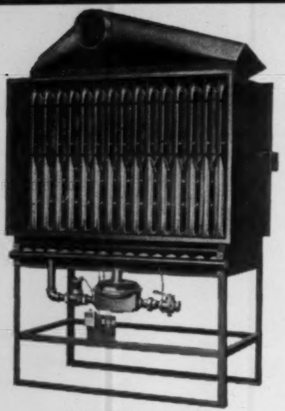
Famous Weirton "Safety Drain" galvanized steel sheets combine maximum protection with outstanding good looks.



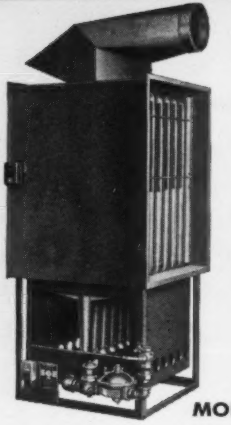
Weirton galvanized V-Crimp sheets are made in 2V-, 3V-, and 5V-crimped, and in gauges 26, 28 and 29; covering width, 24 inches.



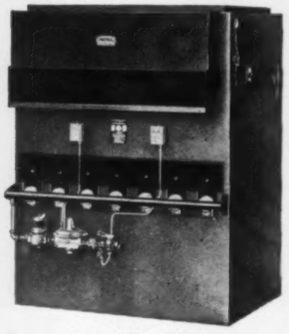
Weirton galvanized corrugated steel sheets are most economical in first cost, and are the strongest form of steel roofing because the corrugations strengthen the entire sheet.



MODEL SED-E



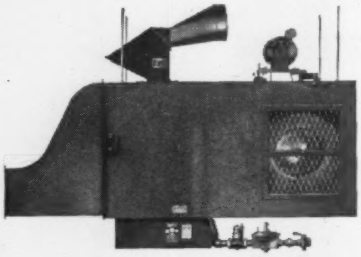
MODEL SED-S



MODEL SED-VF

MODEL SED-E — Non-corrosive type 321 stainless steel heat exchanger. Permits installation downstream of cooling equipment, for continuous blower operation. Air throughput in either direction. 80,000 to 600,000 Btu input.

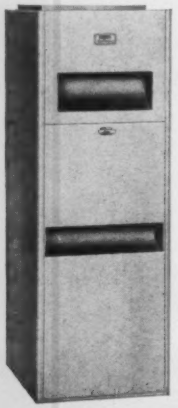
MODEL SED-S — Same as SED-E except controls are at the side, instead of at the end where accessibility requires either SED-E or SED-S is available in sizes from 80,000 to 600,000 Btu input in increments of 40,000 Btu.



MODEL SEU

MODEL SED-VF — Tested and approved as a duct furnace; type 321 stainless steel. Re-circulated or fresh air enters through bottom, sides, or back. Built-in air bypass, vent in front. Sizes from 70,000 to 245,000 Btu input.

MODEL SEU — Suspended unit heater. Recirculates room air. Diffuser outlet with adjustable vertical and horizontal vanes. Double inlet forward curve blower. Continuous duty, variable pitch drives, raised port burners. 80,000 to 600,000 Btu input.



MODEL SEC

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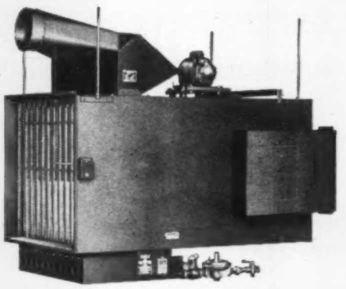

MODEL SES

MODEL SEC — Forced air furnace. Stainless steel heat exchanger sections seam and arc welded. One piece cast iron burners with drilled ports. Oversize double inlet blower, glass or washable filters. 6 sizes — 70,000 to 245,000 Btu input. For zero clearance.

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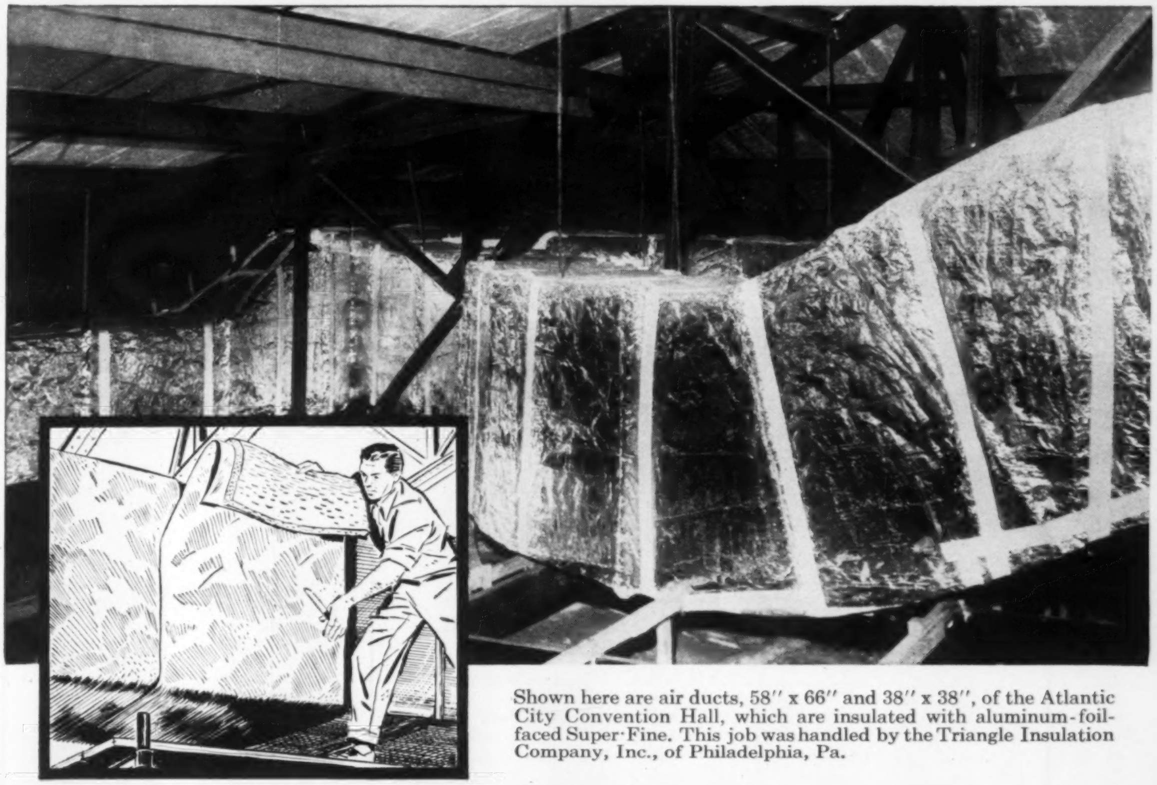
O'Connor-Oklahoma Co., Oklahoma City, Tulsa, Oklahoma & Wichita, Kas.
Smith Steam Specialty Co., Kansas City, Mo.
Toy-Holbrook, Inc., San Francisco, California.
F. R. Young, Houston, Texas.
Dealers Supply Company, Atlanta, Georgia.
Jewell & Company, Hot Springs, Arkansas.
Homer Maxey & Company, Lubbock, Texas.
Noland & Co., Newport News, Va.
Temp-Control Corp., Portland, Oregon

MODEL SES—Forced air, suspended furnace for installation in suspended duct system. Inlet and outlet designed for sheet metal duct connection. Double inlet forward curved blower. Continuous duty variable pitch drives, raised port burners.



Shown here are air ducts, 58" x 66" and 38" x 38", of the Atlantic City Convention Hall, which are insulated with aluminum-foil-faced Super·Fine. This job was handled by the Triangle Insulation Company, Inc., of Philadelphia, Pa.

L·O·F Glass Fibers Super·Fine can reduce installation costs 30%

When you're after an air-conditioning contract, a big saving in insulation cost can be mighty important.

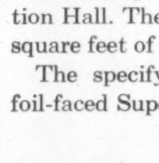
Provided, of course, your insulation material is as good or better than that offered by competition.

Here's a case in point: The Triangle Insulation Co., Inc., installed the insulation on the new air-conditioning system at the Atlantic City Convention Hall. The job involved approximately 16,000 square feet of duct insulation.

The specifying engineer realized that L·O·F foil-faced Super·Fine offered high efficiency in insulation material together with a vapor barrier. *Most important, ¾-pound density Super·Fine could be installed at a 30% saving compared to other methods and materials.*

Here's why installation costs less:—Super·Fine is pliable and will conform to irregular contours. Easy to handle and apply, there's no shaping or fitting with Super·Fine.

Super·Fine's fine glass fibers will not burn or absorb moisture, will not rot or mildew. It is verminproof and rodentproof.



FREE! For helpful folder giving instruction in installation, write: L·O·F Glass Fibers Company, Dept. 39-55, 1810 Madison Avenue, Toledo 1, O.

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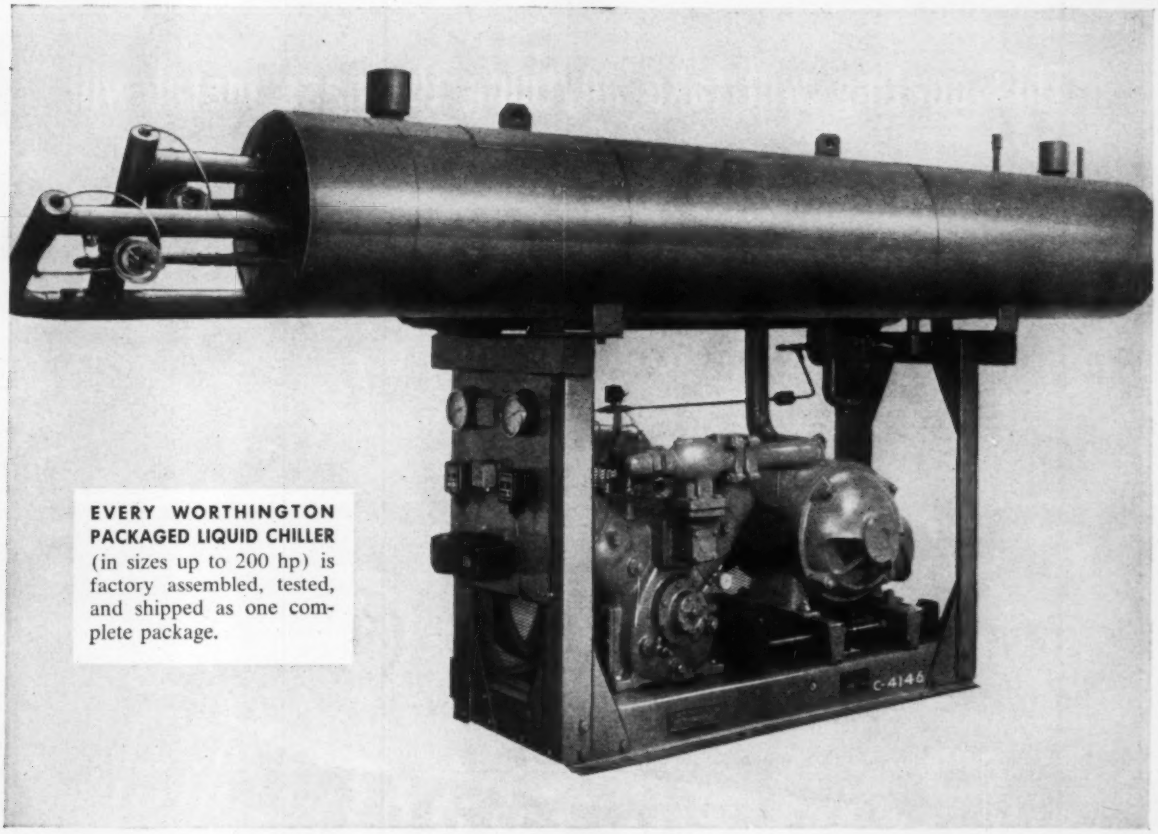

EVERY WORTHINGTON PACKAGED LIQUID CHILLER (in sizes up to 200 hp) is factory assembled, tested, and shipped as one complete package.

Low-cost operation, easy installation . . .

you get both with Worthington's new packaged liquid chiller

If you're interested in process cooling, refrigeration, or air conditioning, take a long look at these six big advantages of the new Worthington packaged liquid chillers:

LOW-COST OPERATION — Simple variable capacity control exactly matches load requirements — results in unusually economical operation.

EASY INSTALLATION — All units are shipped completely assembled. Only simple foundations are needed.

FACTORY ENGINEERING — You benefit from Worthington's undivided manufacturing responsibility. Worthington makes everything — compressor, chiller, drive and controls.

MINIMUM FLOOR SPACE — Efficient, compact design means greatly reduced space requirements.

LONG LIFE — over a million dollars worth of research went into Worthington's Freon compressor — all aimed at making it the most durable unit ever.

WIDE SELECTION — No matter what you want to chill — water or brine — you can get a Worthington packaged liquid chiller that's exactly right for the job. Sizes from 7½ all the way up to 200 hp.

Want more facts? Mail the coupon today for Bulletin C-1100-B52. It tells all about specifications, features, and typical applications. A-5-58-HP

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Air Conditioning and Refrigeration Division
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NABISCO
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Airtherm

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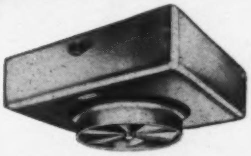
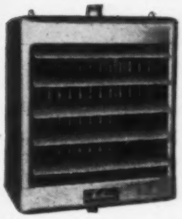




90 VERTICAL DISCHARGE HEATERS INSTALLED from 102,500 BTU to 185,000 BTU

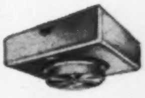
92 HORIZONTAL DISCHARGE HEATERS INSTALLED from 14,800 BTU to 250,000 BTU

WARM THE WORLD'S LARGEST BAKERY

To achieve flexible, economical heating throughout Nabisco's new $20 million Chicago plant, 182 Airtherm steam unit heaters have been installed. The plant is the world's largest cracker and biscuit bakery with ovens the length of football fields, almost 20 acres of floor space and a capacity of 167 million pounds yearly.

When the area to be heated presents unusual problems, chances are you can solve them easily and economically with the flexibility of Airtherm unit heaters.

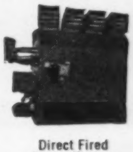
Convectors



Vertical Steam Unit Heaters

Horizontal Steam Unit Heaters

Centrifugal Fan Type Unit Heaters



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...by remote control with

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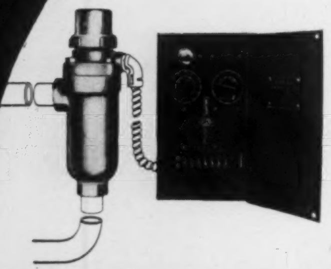
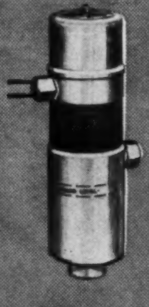


CUTS OPERATING COSTS! It automatically maintains the level you choose. Just set the dial! It may be used to ring an alarm, control a pump or operate any electrical device. For all non-corrosive liquids with specific gravity of 0.5 or more. Write for bulletin 908.

...or with **ALCO J-5 Float Switch**



It holds liquid level to within a ⅝" differential ..."makes" the circuit when the level drops; "breaks" it when the level rises (reverse available). Only two major parts. For freon, methyl chloride, ammonia. Easy to install and service. Write for bulletins 175 and 175-1.

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4. Lowest silhouette tower in the field, the **LOLINE** over-all height is just $7' \, 7\frac{11}{16}''$.
5. Asbestos cement board louvers are installed as standard, not special, equipment on all **LOLINE** towers, for better appearance.
6. The **LOLINE** offers you an internal pipe supply system which permits the architect or engineer to completely conceal the piping. This is optional equipment.
7. The V-belt drive on all **LOLINE** towers features a stainless steel fan shaft for longer tower life.

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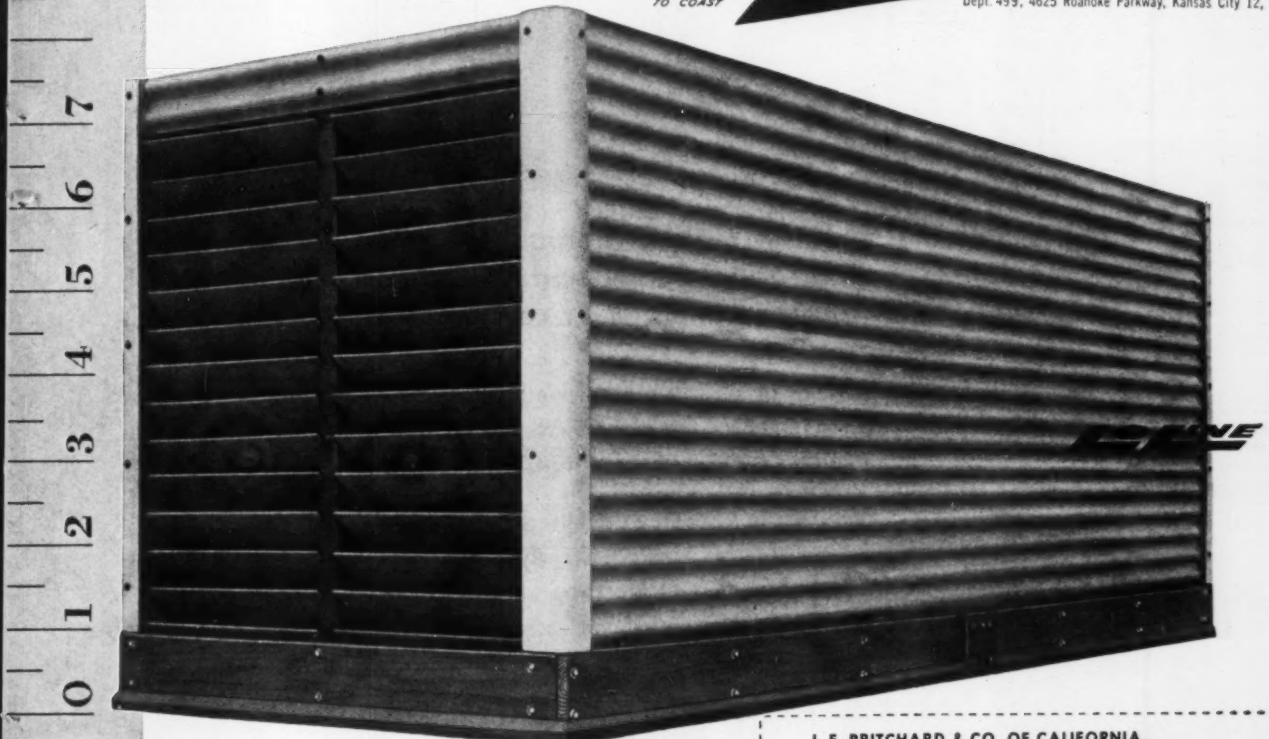

FEET

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Here is *why* the SPORLAN *Catch-All* is the PERFECT FILTER-DRIER!

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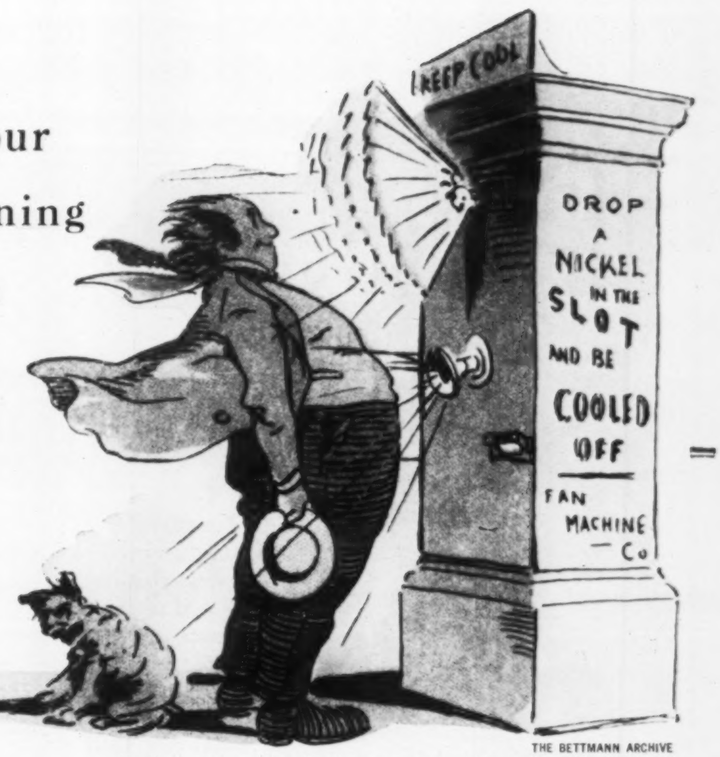
air conditioning
problem
can be
a "breeze"—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STUART INVESTMENT BUILDING, Lincoln, Nebraska. Contractor: Sidles Company. Built in 1937.

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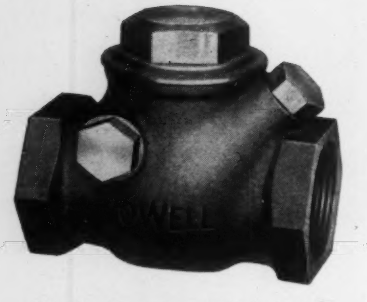


FIG. 560—Bronze Regrindable Horizontal Swing Check Valve for 200 Pounds W. S. P.

Powell Valves are the choice of engineers because they know every valve is precision made, meeting every specification—every time.

And there are other good reasons why engineers prefer Powell Valves—because Powell Valves are dependable . . . economical . . . and Powell has the COMPLETE quality line of valves.

Consult your Powell Valve distributor. If none is near you, we'll be pleased to tell you about our complete line, and help solve any flow control problem you may have.

The Wm. Powell Company
Cincinnati 22, Ohio...109th year

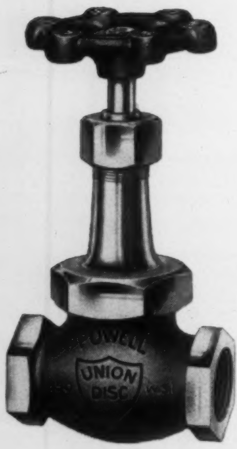


FIG. 150—Bronze Vulcanized Composition Disc Globe Valve for 150 Pounds W. S. P.

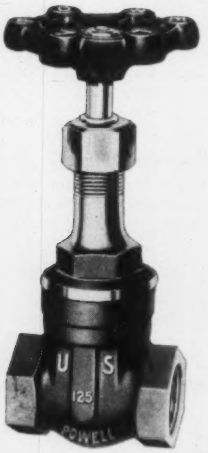


FIG. 500—Bronze Screwed-in Bonnet Gate Valve for 125 Pounds W. S. P.

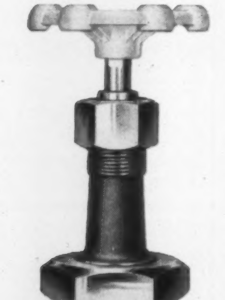
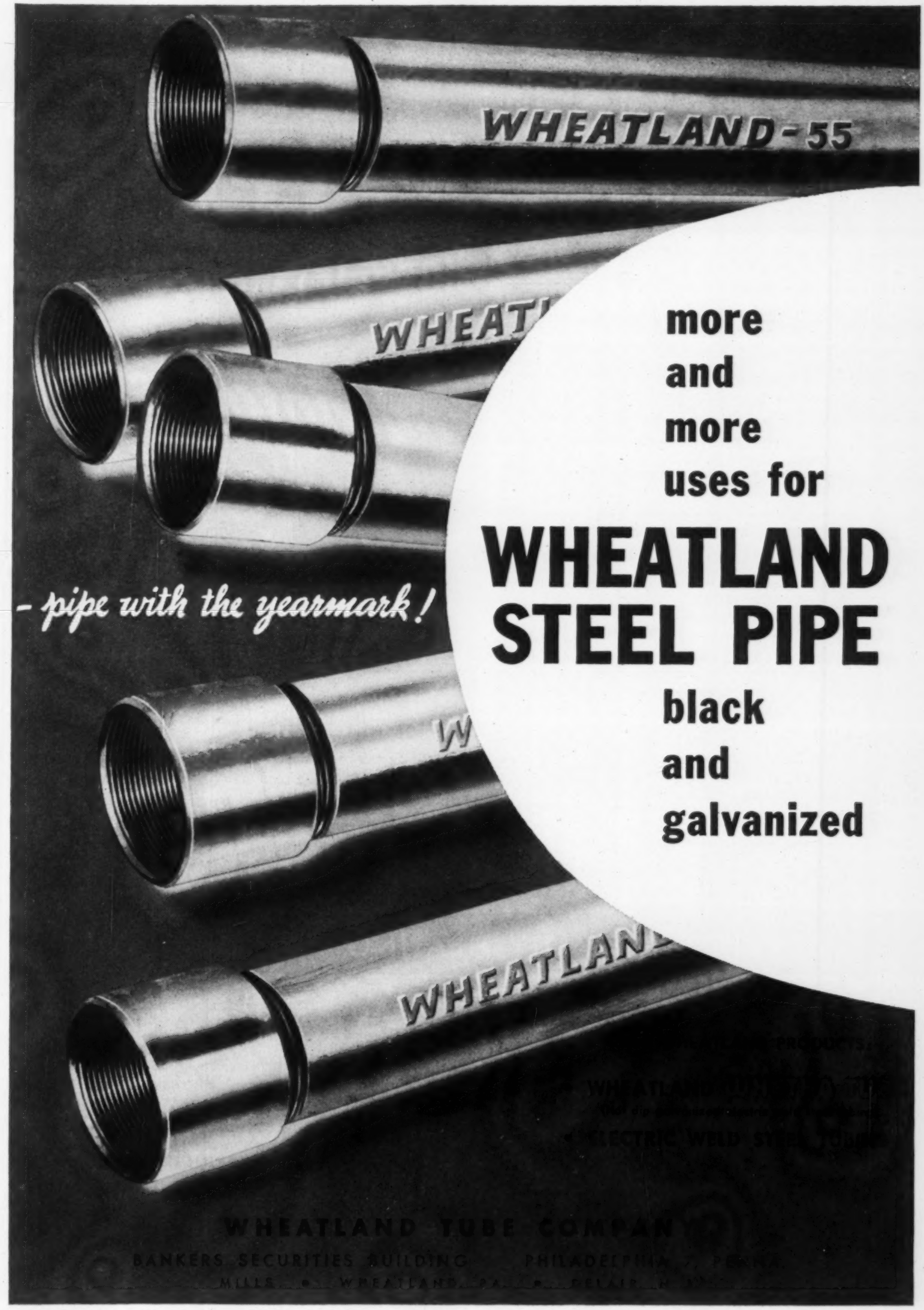


FIG. 2608—Bronze Full Flow Globe Valve for 200 Pounds W. P.

POWELL VALVES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galvanized

[illegible] PRODUCTS:

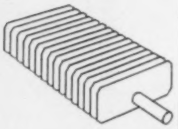
- WHEATLAND [illegible]
  (Hot dip [illegible])
- ELECTRIC WELD STEEL TUBING

WHEATLAND TUBE COMPANY
BANKERS SECURITIES BUILDING   PHILADELPHIA 7, PENNA.
MILLS • WHEATLAND, PA. • DELAIR, N. J.

KRITZER
Radiant Panel Heating
offers these
advantages to the Heating Contractor

★ KRITZER QUALITY

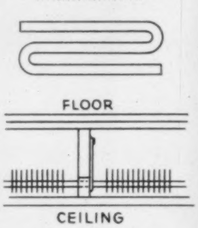
Lifetime coils of heavy aluminum fins permanently bonded to ⅝" O.D. copper tube. Materials and workmanship guaranteed.



★ LOW INSTALLATION COST

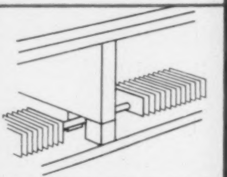
One section of Kritzer Coils equals many lengths of ordinary tubing.

Heating contractor can install entire system without special cooperation from other contractors because the coils are *not imbedded in any building material.*



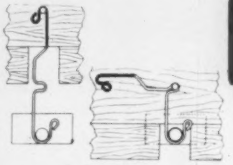
★ NO HEAT DAMAGE

Coils heat air only; they do not touch any part of the building. Therefore, no "call backs."



★ EASY INSTALLATION

With Kritzer "Redhead" hangers, the coils automatically go into proper position. All joints are sealed with solder rings.



★ CUSTOMER SATISFACTION

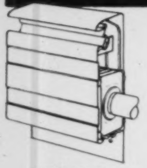
Thousands of Kritzer Radiant Panel installations are providing satisfying, healthful comfort in all climates—in all weather. A satisfied customer is your best salesman. Build a sales force with Kritzer Radiant Panel Heating.

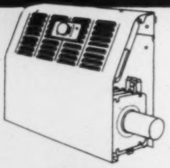
WRITE FOR BULLETIN 155

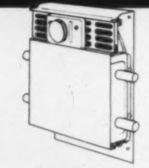
Please send your request on your company letterhead to:
KRITZER RADIANT
COILS, INC.,
2901 Lawrence Avenue,
Chicago 25.

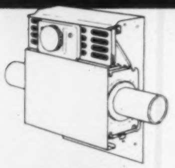
KRITZER
Bulletin RP-155
RADIANT PANEL HEATING
KRITZER RADIANT COILS

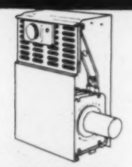
KRITZER QUALITY HEATING PRODUCTS

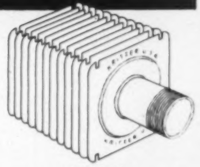

"K" LINE BASEBOARD


SLOPE TOP BASEBOARD


STANDARD BASEBOARD


UNIVERSAL BASEBOARD


CONVECTOR, SLOTTED FRONT


KRITZER FINNED TUBE

REPRESENTATIVES IN PRINCIPAL CITIES
SEE YOUR JOBBER FOR KRITZER PRODUCTS

KRITZER

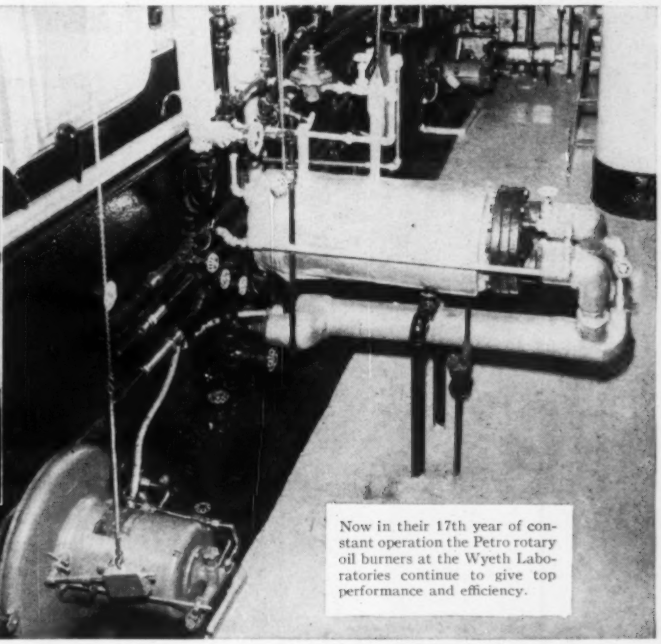
"IF IT'S KRITZER, IT'S RIGHT, SIR!"

Petro Industrial Oil Burners

PAID FOR THEMSELVES DURING THE FIRST YEAR

for the

WYETH LABORATORIES, INC.
Philadelphia, Pa.



Now in their 17th year of constant operation the Petro rotary oil burners at the Wyeth Laboratories continue to give top performance and efficiency.

"Petro oil burners saved us $6,349 on fuel the first year—and in addition we enjoy better heating and more horsepower from our boilers," says E. C. Beeler, Plant Engineer.

FUEL SAVINGS JUST DON'T HAPPEN—there has to be a reason—and the Petro "Thermal Viscosity System" is the reason Petro equipment owners all over the country save thousands of dollars every year! It's a simple, foolproof fuel preheating system which lowers the viscosity of the low-cost, heat-rich heavy oils and enables users to burn them with complete reliability.

Here's how it works

To properly fire No. 6 oil, the oil must be *warmed* so that it will thin out and ignite easily and atomize efficiently. To accomplish this vital need Petro burners have a magnetic valve which is controlled by the oil temperature and will not admit oil to the rotary atomizing cup until it is warm enough to fire properly. The oil is circulated through automatic heaters until the proper temperature is reached. Heaters are of ample capacity to supply warm oil for any firing need.

Thus Petro oil burners assure owners (1) accurate metering of oil (2) fine, thorough atomization (3) quick starts, no smoky fires (4) no slug of cold oil in lines to cause faulty starts.

No manual attention is required

The entire operation is automatic. There are no involved mechanical controls requiring adjustment or maintenance.

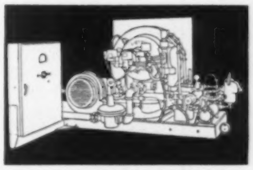
Saves labor costs—saves fuel costs

Why don't you find out how much Petro industrial oil burners can save for you? They are quickly adaptable to nearly every existing boiler. Send in the coupon for full information.

OVER 50 YEARS OF LEADERSHIP IN AUTOMATIC HEATING AND POWER EQUIPMENT

PETRO

T.M. REG. U.S. PAT. OFF.



COMPLETE PACKAGED UNIT

A complete forced draft combustion system with all parts factory assembled and tested. Saves installation time and cost, gives top performance and fuel economy.

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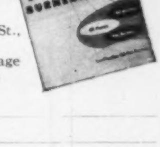

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Please send the 20-page illustrated Petro catalog.

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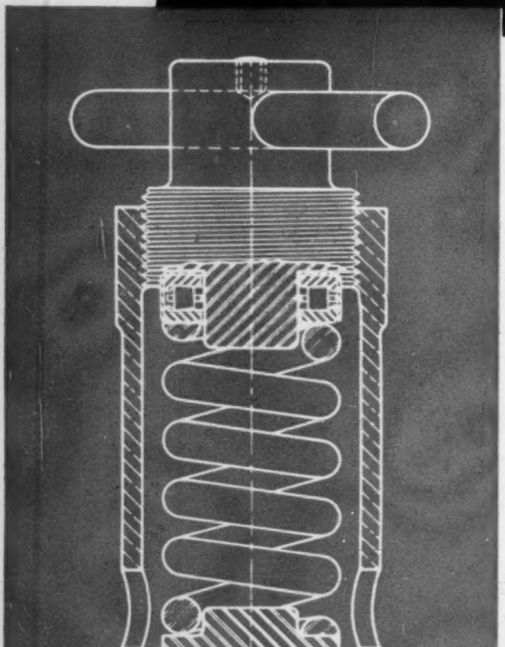


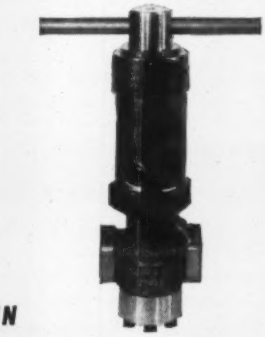
CASH STANDARD

TYPE 345

Pressure Reducing and Regulating Valve

Designed for hydraulic presses, hydraulic systems, die-mold apparatus and high pressure pneumatic systems (oxygen, nitrogen, hydrogen).

- For use on air, water, oil and various gases (not for steam)
- Inlet pressures: 500 to 4000 psig
- Delivery pressures: 400 to 3000 psig
- Bronze or steel construction
- Piston-operated with O-ring seals
- T-bar adjusting screw combined with roller thrust bearing for ease of adjustment
- Internal strainer screen
- Corrosion resistant
- Operating fluid around renewal unit results in equal expansion and contraction of internal mechanism, precludes sticking or seizing
- Easily serviced without removal from line
- Renewable inner units of nitrided or stainless steel. For severe conditions, stellite facing is available
- Screwed ends, sizes ½", ¾", 1"



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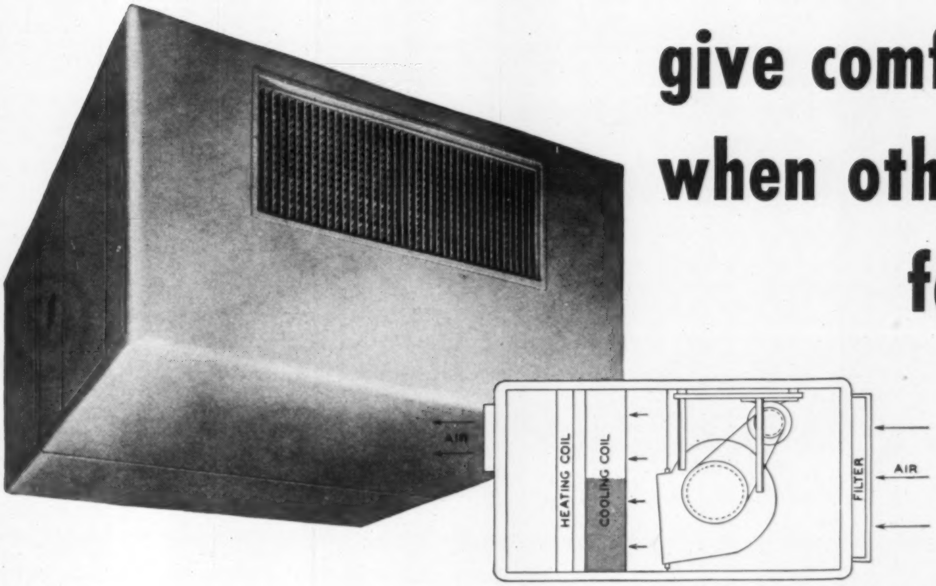
CASH CS STANDARD

A. W. CASH COMPANY • P.O. BOX 551, DECATUR, ILL.

PRESSURE, HYDRAULIC, TEMPERATURE, PROCESS AND COMBUSTION CONTROLS

KRAMER

AIR CONDITIONING UNITS with MUGGY-AIR CONTROL



give comfort when others fail!

Another new Kramer achievement. Muggy-Air-Control takes the "chill and dampness" out of cooling on "muggy days" without reheat or dampers.

With two independent refrigerant circuits the upper circuit can be cut out on high humidity days. This sharply increases the dehumidifying effect by lowering the coil refrigerant temperature. Air is by-passed through the non-operating circuit and will mix with the dehumidified air to give desirable discharge temperatures and thus overcome short-cycling and uncomfortable conditions on muggy days.

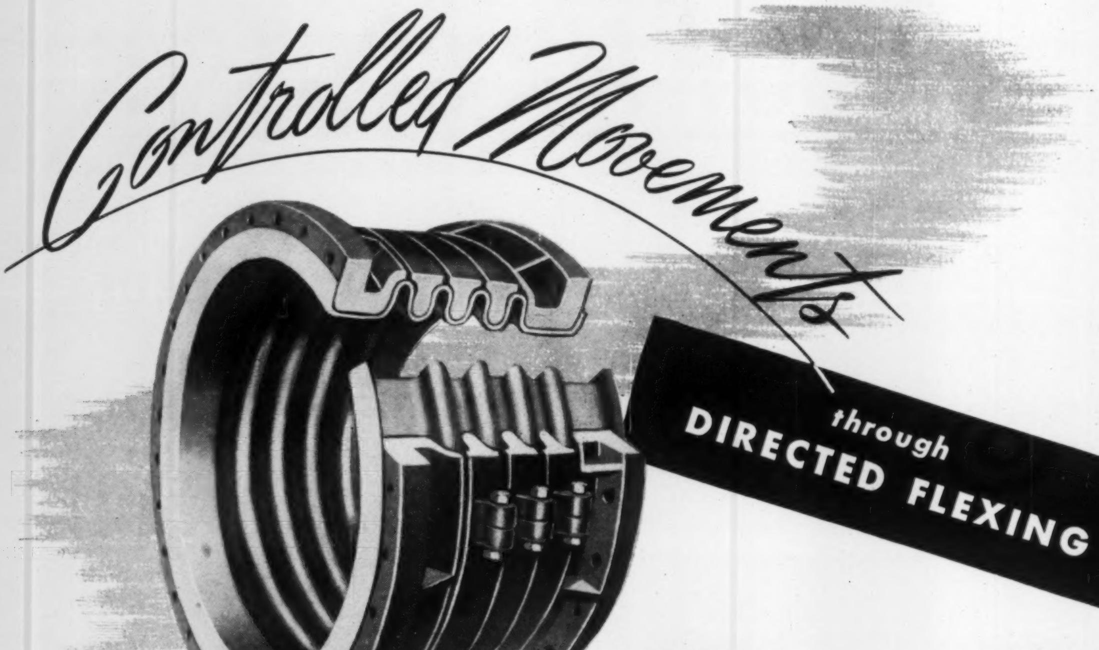
Other distinct features of the Kramer Air Conditioning Unit are: the "Blow-Through" design, the Anti-Sweat construction, the "floating power" mounting, the nearly silent operation, and the eye appealing design.

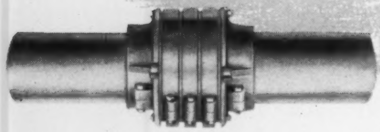
WRITE FOR BULLETIN NO. AC-238

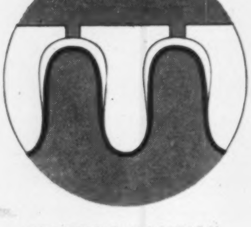
KRAMER TRENTON CO. • Trenton 5, N.J.

BADGER *Expansion Joints*

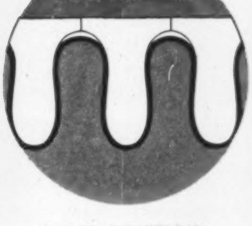
Typifying Expansion Joint Engineering At its Best







STARTING POSITION
(LINE COLD)



FINAL POSITION
(FULL TEMPERATURE)

WITH THE OLD STYLE corrugations, there was little control over the flexing movement. Our engineers long ago found this to be a major cause of uncertain joint life and set about to solve the problem.

Directed Flexing, based on a scientifically engineered design of all-curve corrugation, solved the problem. That was some years ago. Notwithstanding continual further studies, nothing anywhere has supplanted Directed Flexing as a major design factor in long joint life. It's another example of what engineering has done to make the Badger Expansion Joint 'tops' in its field.

Badger Expansion Joints come in a variety of types and a wide range of sizes: Directed Flexing, Self-Equalizing for normal and long traverses and higher pressures; Non-Equalizing, for short traverse or when pressures are low; Tandem Joints for combination axial and lateral movements; Clevis-Hinged Joints for angular movements; Flexible Pipe Line Seals for Watertight connections between pipes and flood walls.

BADGER MANUFACTURING COMPANY
Original and Sole Manufacturer of Badger Expansion Joints
230 BENT STREET · CAMBRIDGE · MASS.

WHY IT PAYS
TO DO BUSINESS
WITH THE
LEADER

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TUBE-TURN
TRADE MARK

Tube Turns' nearby complete stock SAVES YOUR PURCHASING TIME

Tube Turns' pioneering research GIVES YOU ADVANCED PRODUCTS

Tube Turns' engineering help GIVES YOU COST-CUTTING IDEAS

How you get *more for your money* with our stainless steel fittings

THE ANSWER to many piping problems (such as corrosive conditions) is found with stainless steel. For these applications too, you'll find it pays to buy "TUBE-TURN"*.

The *complete line* of TUBE-TURN Stainless Steel Welding Fittings and Flanges includes AISI Types 304, 304 L, 347 and 316 . . . thin wall and heavy wall . . . to match your needs. They give you these extra values at no extra cost: Meet *all* code specifications . . . Have greater uniformity of wall thickness . . . Match bursting strength of pipe. You can simplify purchases by ordering them *from your nearby Tube Turns' Distributor* on the same order with other TUBE-TURN Welding Fittings and Flanges . . . the world's most complete line.

TUBE-TURN Welding Fittings and Flanges are made in U. S. A.
They meet all U. S. piping code specifications.

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A Division of National Cylinder Gas Company

DISTRICT OFFICES: New York • Philadelphia • Pittsburgh • Cleveland • Detroit • Chicago • Denver • Los Angeles
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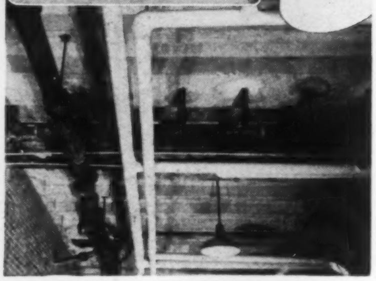
Reg. U. S. Pat. Off.

SPANG® CW STEEL PIPE
gives top-flight service
SPANG CW

at Charlotte Municipal Airport



Owner: **The City of Charlotte, N.C.**
Architect: **Walter Hook and Associates, Inc., Charlotte, N.C.**
General Contractor: **J. A. Jones Construction Company, Charlotte, N.C.**
Plumbing Contractor: **Baskerville-Howell, Charlotte, N.C.**
Spang Distributor: **Baker-Mitchell Company, Charlotte, N.C.**

The citizens of Charlotte, North Carolina, are proud of their $2,000,000 Municipal Airport. Five years ago the plans were started for this airport. Three years later the construction began. In the span of those two years, the air travel and freight into Charlotte increased beyond all expectations, and authorities knew that the size and capacity of the building and runways as originally planned were totally inadequate.

To meet the new demands, the final expenditure totaled more than four times the original estimate. Now in full operation, Charlotte Municipal Airport offers *top-flight* service and comfort to passengers and visitors.

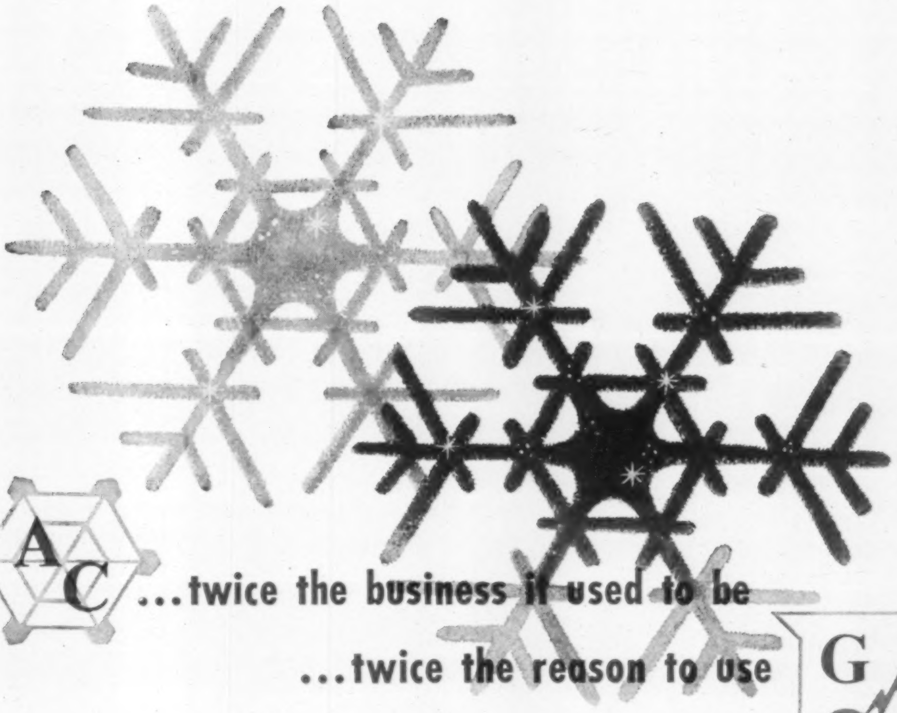
To provide *top-flight* service for fire mains, roof drains and gas, vent and water lines, 15 tons of *top-quality* SPANG CW Steel Pipe were installed in the three-story airport building. The contractors on this job knew they could depend on the quality and service of SPANG, because SPANG pipe is *quality-controlled* from the skelp to the finished pipe.

Careful selection of top-grade skelp . . . close control during forming and welding . . . complete testing and inspecting assures you of *top-quality* pipe—pipe that's easy to bend, cut, thread and weld. That's why SPANG CW can give you faster installations and save you money on the job. That's why so many contractors and builders consistently specify SPANG CW Steel Pipe.

Why not let SPANG CW give you *top-flight* service? See your nearest SPANG distributor for your next order of pipe.

SPANG-CHALFANT
DIVISION OF THE NATIONAL SUPPLY COMPANY
General Sales Office: Two Gateway Center, Pittsburgh, Pa. District Sales Offices: Atlanta, Boston, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, St. Louis.

SPANG
CW
STEEL PIPE
SPANG CW

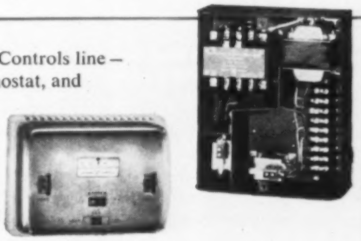


AC ...twice the business it used to be

...twice the reason to use GC

It's twice the business, any way you look at it. The new demand for residential cooling has become an overnight giant – and a giant "twin" at that. Heating is added to cooling, more and more for "year around comfort" jobs. But no matter how much or how fast your opportunity grows – you still have the advantage of working with one source you know you can depend on – with one responsibility for all the controls that make your jobs right . . . automatically. Put General Controls' long established leadership in all these fields (particularly in combined heating and cooling) to work for you. Write for complete catalogs today.

Outstanding team from complete General Controls line – decorator styled heating and cooling thermostat, and master control panel which makes it possible to tie in both refrigeration and heating controls in the central furnace.



General Controls
AUTOMATIC
Heating and Air Conditioning
CONTROLS

1930 25 YEARS 1955
1955 SILVER JUBILEE YEAR

GENERAL CONTROLS

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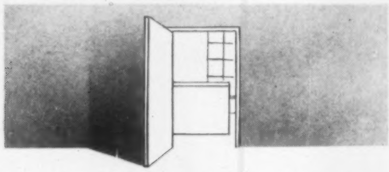
MANUFACTURERS OF AUTOMATIC CONTROLS FOR THE HOME, INDUSTRY AND THE MILITARY

OPPORTUNITY

If your product contains a tubular-shaped component, it's a good bet that Wolverine can make it better and at a lower cost.

The opportunity lies in Wolverine Fabricated parts. Spinning, finning, bending, beading, flaring, reducing—many other techniques—are used. Tubing is furnished exactly as needed—to your specifications—under rigid quality control.

You can get money-saving ideas from Wolverine's Field Engineering Service. Answers to such questions as alloys, design, corrosion and fabrication techniques are given every day.



Open your door for a Wolverine quote—*and opportunity!* Just write WOLVERINE TUBE, 1461 Central Avenue, Detroit 9, Michigan.

Send for a copy of Wolverine's fabricated tubular parts book

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DIVISION OF CALUMET & HECLA, INC.
Manufacturers of Quality-Controlled Tubing and Extruded Aluminum Shapes

PLANTS IN DETROIT, MICHIGAN, AND DECATUR, ALABAMA • SALES OFFICES IN PRINCIPAL CITIES
EXPORT DEPT., 13 E. 40TH ST., NEW YORK 15, N.Y.

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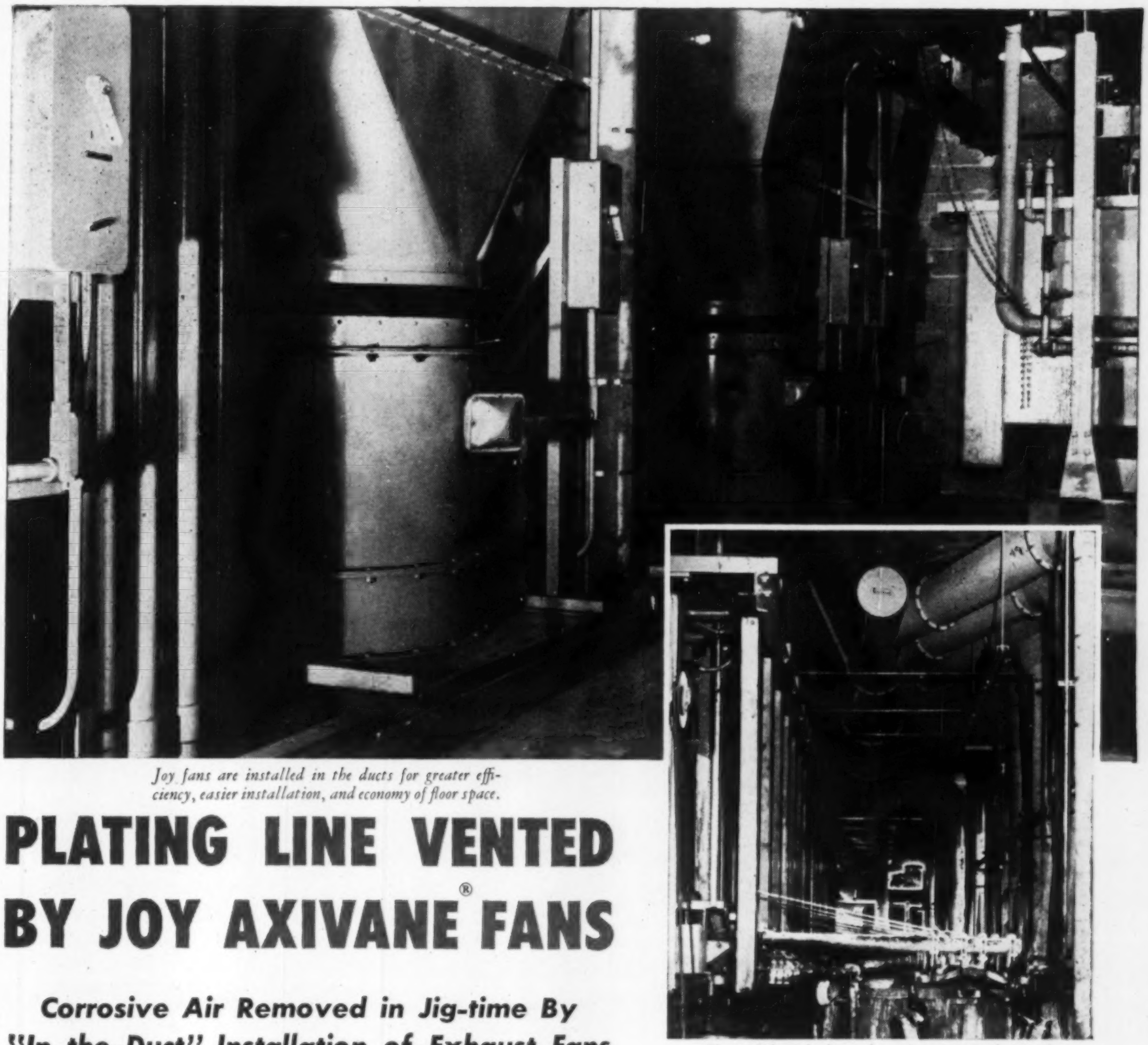


Joy fans are installed in the ducts for greater efficiency, easier installation, and economy of floor space.

Vertical branch ducts draw fumes into the trunk line for ultimate discharge into the atmosphere.

PLATING LINE VENTED BY JOY AXIVANE® FANS

Corrosive Air Removed in Jig-time By "In-the-Duct" Installation of Exhaust Fans

An interesting, and necessary, feature of the new zinc and cadmium plating line at Appleton Electric Company, Chicago, is the compactness of the Joy Axivane Fan exhaust system.

This exhaust system carries off the hot, corrosive air from the plating line up to the roof where it is discharged into the atmosphere.

Centrifugal units would have necessitated an expensive modification in the building structure, in addition to a larger, more complicated duct system.

The compact, in-line design of the Joy Axivane Fans permitted installation *right in the ducts* on the floor above the plating line. Floor space was saved, installation costs were drastically reduced, building structure did not have to be altered, and a much smaller and simpler duct system was constructed!

Joy Axivane Fans will show you new standards in efficiency, compactness, quietness, and outstanding versatility. There are 136 models . . . all with adjustable blades . . . for volumes up to 300,000 CFM and pressures to 11″ wg. Get the full story on Joy Fans by writing for Bulletin J-611, TODAY. **Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

Consult a Joy Engineer, or WRITE FOR THIS BOOKLET #J-611

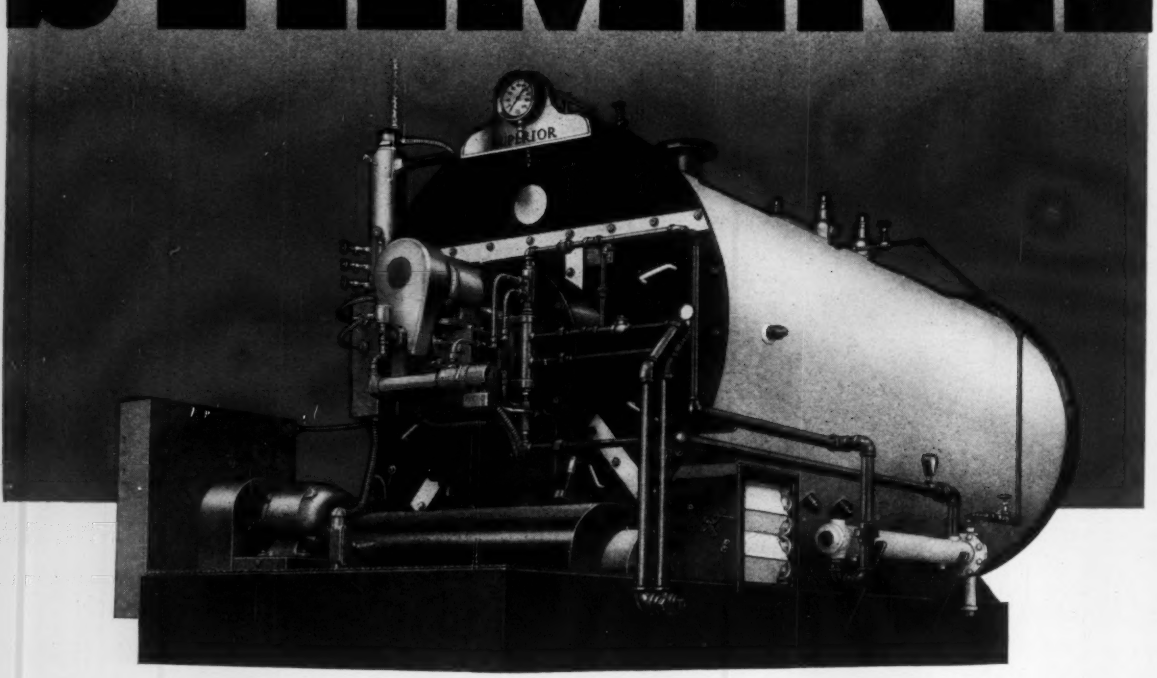
JOY
AXIVANE FANS

W&D I 5378

JOY

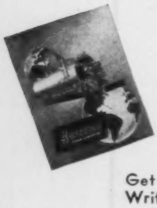
SPECIALISTS IN THE COMPRESSION AND MOVEMENT OF AIR AND GASES SINCE 1885

STAMINA



for YEARS of low cost steam

Boilers, too, grow old . . . and when the honeymoon of the first year or two is over, dirt, scale, and wear on moving parts start to take their toll in loss of efficiency. That's why Superior Steam Generators are built bigger, heavier, and more rugged, with four-pass construction and full 5 sq. feet of heating surface per boiler horsepower, measured on the smaller I.D. of the tubes. The relatively slow speed full bank induced draft fans, the larger triple-blow-down water column, and the rigid channel iron base are other typical features of design which add the stamina that makes efficient low cost steaming a reality . . . not for a year or two; but throughout the long life of the unit.



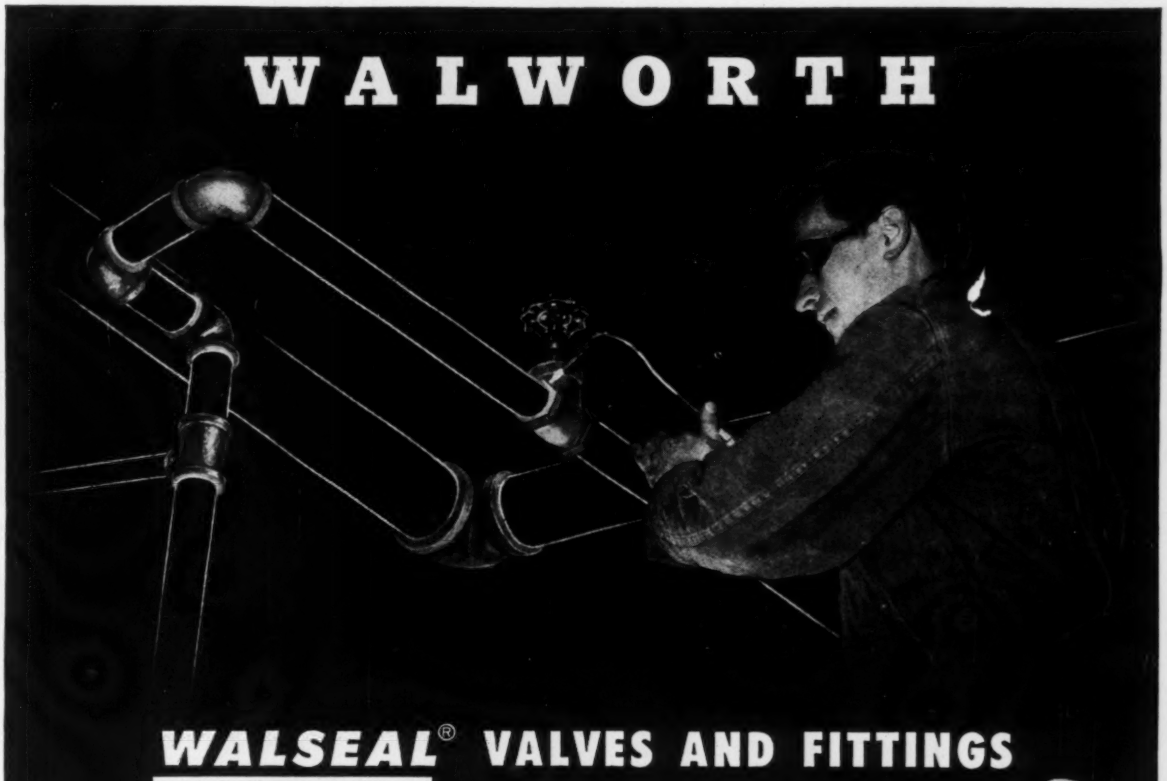
Get the complete story. Write for Catalog 704 describing 18 sizes from 20 to 600 b.h.p; pressure to 250 p.s.i. burning oil or gas or both.

for performance you can ***BANK*** *on*

SUPERIOR
STEAM GENERATORS

SUPERIOR COMBUSTION INDUSTRIES INC.
TIMES TOWER, TIMES SQUARE, NEW YORK 36, N.Y.

WALWORTH



WALSEAL® VALVES AND FITTINGS

Better because... **There's no guesswork when a silver-brazed joint is made with a Walseal fitting. Sil-Fos alloy, which appears as a fillet at the face of a Walseal joint, comes from rings which have been factory-inserted in the end connections of Walseal fittings. The bright silver alloy fillet that you can see assures full penetration of alloy for a permanently leakproof joint.**

Cutaway view of a Walseal Tee showing: factory-inserted ring of silver brazing alloy; fillet of silver brazing alloy that appears upon completion of Walseal joint; cutaway view of the completed joint showing that silver brazing alloy has flowed in both directions from the factory-inserted ring.

Walseal is a registered trade mark which identifies valves and fittings manufactured by the Walworth Company. Walseal products have factory-inserted rings of silver brazing alloy in threadless ports. Walseal joints can be made only with Walseal valves and fittings.

If you're piping water, oil, steam, air, oxygen, nitrogen, helium or other industrial gases or refrigerants through brass, copper, or copper-nickel pipe, you'll want to investigate Walseal — available in complete lines of valves and fittings in four distinct pressure ranges — from 0 to 5000 psi. working pressure*. Your copy of Circular 115 will be sent on request . . . see your near-by Walworth Distributor today, or write to: Walworth Company, General Offices, 60 East 42nd Street, New York 17, N. Y.

*Walseal fittings and valves are being used at sub-zero temperatures as low as —350 F.

Make it "a one-piece pipeline" with WALSEAL

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WALWORTH

Manufacturers since 1842

valves . . . pipe fittings . . . pipe wrenches

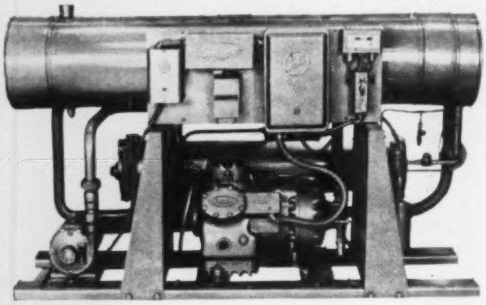
60 East 42nd Street, New York 17, N. Y.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

New **CARRIER** Units...

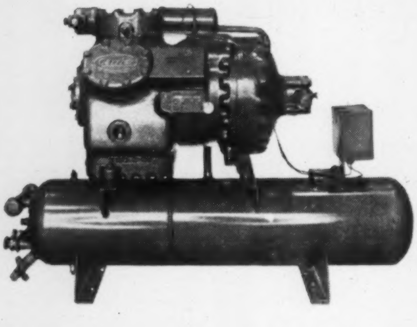
Here's the last word in Carrier components! Build them up into profitable, low-cost, ductless air conditioning systems—with individual controls for every room!

Compact, new water-chilling units come in five additional sizes!



- Now available in capacities of 5, 7½, 10, 15 and 20 hp. in addition to present sizes 25 to 100 hp.
- Completely assembled with water cooler and condenser, hermetic compressor, motor and starters, water pump and pump motor, all mounted on one base.
- Thoroughly tested and Carrier guaranteed.

Rugged, new condensing unit features hermetic compressor!



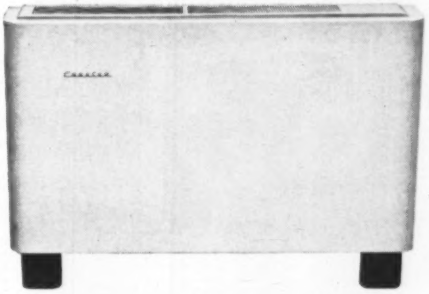
- Hermetic compressor-motor unit is compact, readily accessible for complete servicing without special tools.
- For air conditioning applications, this new machine is available in 2, 3, 5, 7½ and 10 hp.; for commercial refrigeration, 2, 3, 5 and 7½ hp.
- Designed for air conditioning and refrigeration systems having evaporator temperatures ranging from —10°F. to +55°F. with water-cooled condensing unit remotely installed.

WANT MORE DETAILS? Please call your local Carrier dealer, distributor or branch office. They're listed in the Classified Telephone Directory. Or write directly to Carrier Corporation, Syracuse, New York.

for Motels, Hotels and Offices

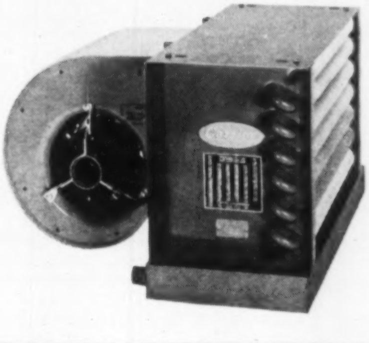
Put them to work getting new
business for you—
in new and existing buildings.

Flexible, new fan-coil unit installs easily—anywhere!



- Can be mounted horizontally or vertically—with or without cabinet. Stand it on the floor or attach it to the wall. May be furred in or recessed under a window, or installed completely in the room.
- Available in three sizes—½, 1 and 1½ tons.
- Features quiet, 3-speed fan, all-around insulation, top air discharge, optional outside air intake, prime-coated cabinet finish. For chilled or hot water.

Compact, new fan-coil unit for overhead installation!



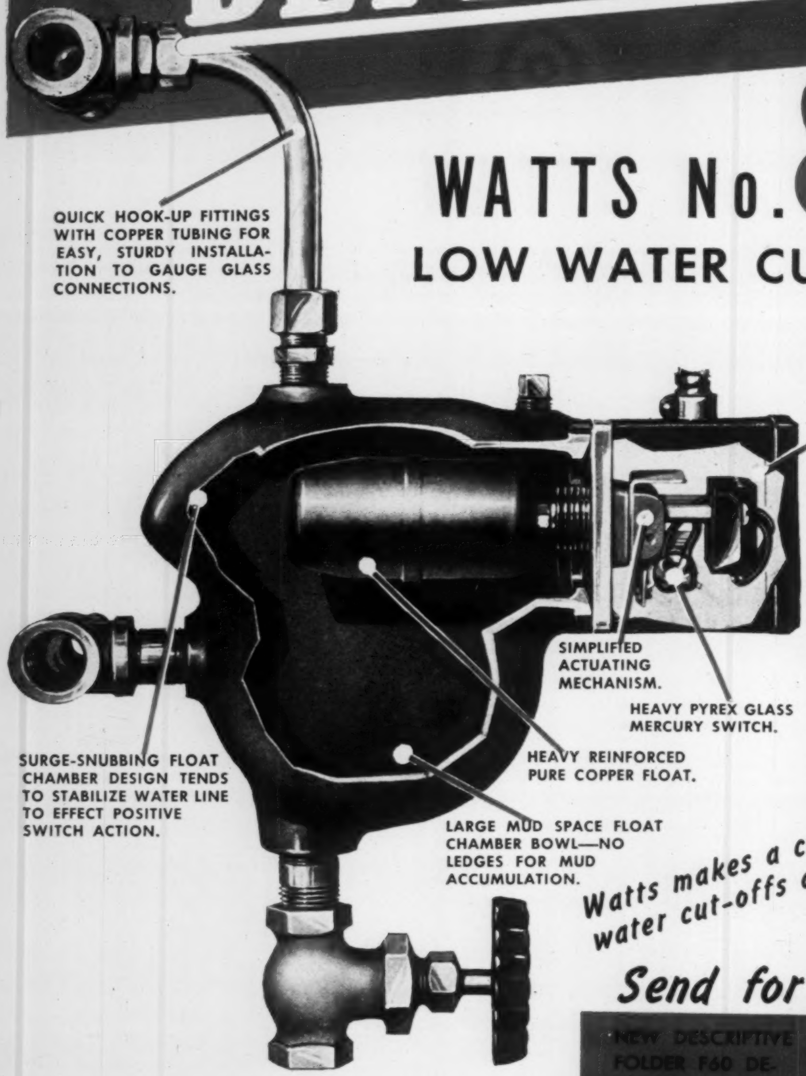
- Easily installed in top of closet, over corridor or hallway, or behind wall.
- Available in three sizes—½, ¾ and 1 ton.
- Features quiet, direct drive, 3-speed centrifugal blower, smooth helical fin coil surface, high operating efficiency at low cost. For chilled or hot water, or direct expansion.

Carrier AIR CONDITIONING · REFRIGERATION · INDUSTRIAL HEATING

DEPENDABLE

WATTS No. 89A

LOW WATER CUT-OFF


QUICK HOOK-UP FITTINGS WITH COPPER TUBING FOR EASY, STURDY INSTALLATION TO GAUGE GLASS CONNECTIONS.
AMPLE WIRING SPACE WITH BARRIER TO PROTECT SWITCH MECHANISM.
SIMPLIFIED ACTUATING MECHANISM.
HEAVY PYREX GLASS MERCURY SWITCH.
SURGE-SNUBBING FLOAT CHAMBER DESIGN TENDS TO STABILIZE WATER LINE TO EFFECT POSITIVE SWITCH ACTION.
HEAVY REINFORCED PURE COPPER FLOAT.
LARGE MUD SPACE FLOAT CHAMBER BOWL—NO LEDGES FOR MUD ACCUMULATION.

Every characteristic that heating contractors and journeymen want in low water cut-offs is found in WATTS No. 89A. *Their excellence is attested by their wide acceptance.*

Watts makes a complete line of low water cut-offs and boiler water feeders.

Send for . . .

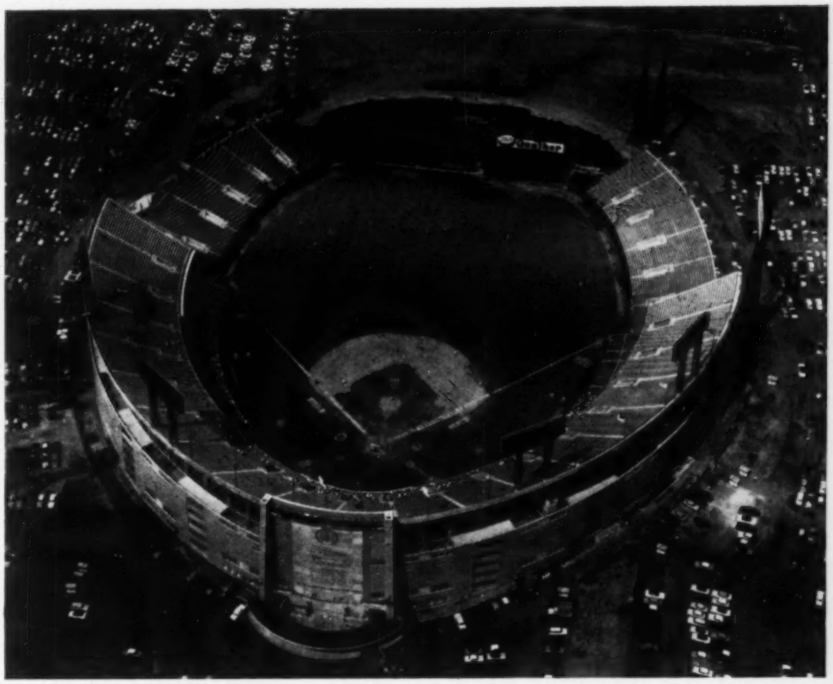
NEW DESCRIPTIVE FOLDER F60 DESCRIBING OUR BOILER WATER LEVEL CONTROLS

WATTS
BOILER WATER LEVEL CONTROLS
80 YEARS

WATTS REGULATOR COMPANY

LAWRENCE MASSACHUSETTS

"EXCELLENCE IN WORKMANSHIP"



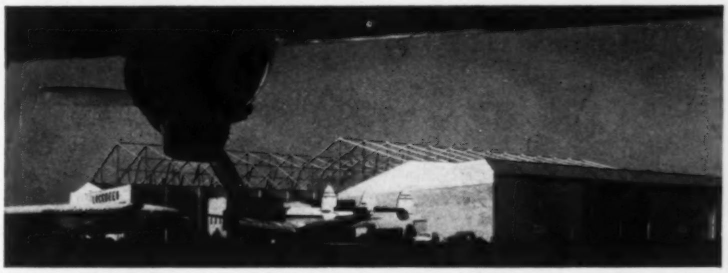
Hundreds of feet of Beth-Co-Weld Pipe are used in the heating and plumbing lines at Baltimore's Memorial Stadium, home of the Baltimore Orioles. *Mechanical Contractors (first phase):* The George H. Schuman Co., Inc.; *(second phase):* H. E. Crook Co., Inc., both of Baltimore; *Pipe Jobbers:* Schumacher & Seiler and J. T. Roberts & Bro., Inc., Baltimore.

Recent Construction with Beth-Co-Weld

Whether the job is small or large, residential or industrial, you'll do well to use Beth-Co-Weld steel pipe for heating and plumbing lines.

Beth-Co-Weld is ideal pipe for general-purpose piping because it's made from sound steel by the continuous-weld process. Beth-Co-Weld is uniform, too—uniform in quality, in physical characteristics, and in strength of weld.

Your jobber furnishes Beth-Co-Weld in sizes from ½ in. to 3 in., standard weight and extra strong, in 21-ft lengths, plus or minus 1 in. He also supplies it in 3½ and 4 in., standard weight only, in lengths of approximately 22 ft.



This Lockheed Aircraft Service-International facility at New York International Airport has Beth-Co-Weld Pipe in its heating and fuel-line piping. *Contractor:* J. E. Schecter Corp., New York; *Jobber:* Chas. F. Guyon, Inc., New York.

Men's Residence Hall at Florida State University, Tallahassee, has heating and plumbing lines of Beth-Co-Weld steel pipe. *Pipe Jobber:* The S. B. Hubbard Co., Jacksonville, Fla.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

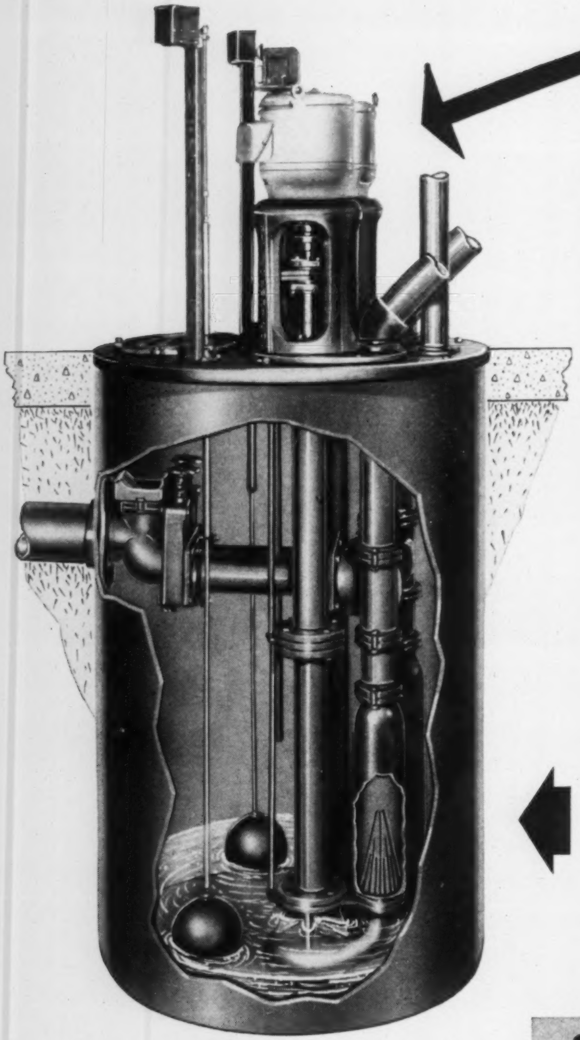
On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETH-CO-WELD STEEL PIPE

Avoid pump clogging trouble....

with "FLUSH KLEEN"®
SEWAGE EJECTORS



Type "F" submerged
"Flush Kleen" sewage ejector

This is the only truly clog-proof sewage ejector. Only liquid is handled by the impeller. All other air or liquid ejectors have working parts in contact with coarse sewage material that causes clogging. In the "Flush Kleen" all coarse matter is strained out, then back-washed from the strainer into the higher level sewer. Of the more than 8000 "Flush Kleen" sewage ejectors used on ships, military installations, municipal lift stations, commercial and industrial buildings of all kinds, not one has ever clogged.

Protect your client — and your reputation. Guarantee owner satisfaction by specifying "Flush Kleen" sewage ejectors wherever sewage must be pumped.

OPERATING DETAILS

"Flush Kleen" sewage ejectors are usually installed in duplex units and operate alternately. While one pump operates, sewage flows into the wet basin through the idle pump. A strainer ahead of the pump impeller retains all coarse sewage matter. (see cutaway)

When the idle pump starts, the coarse sewage matter in the strainer chamber is flushed into the discharge pipe with liquid sewage.

A special check valve prevents discharges back into the inlet line.

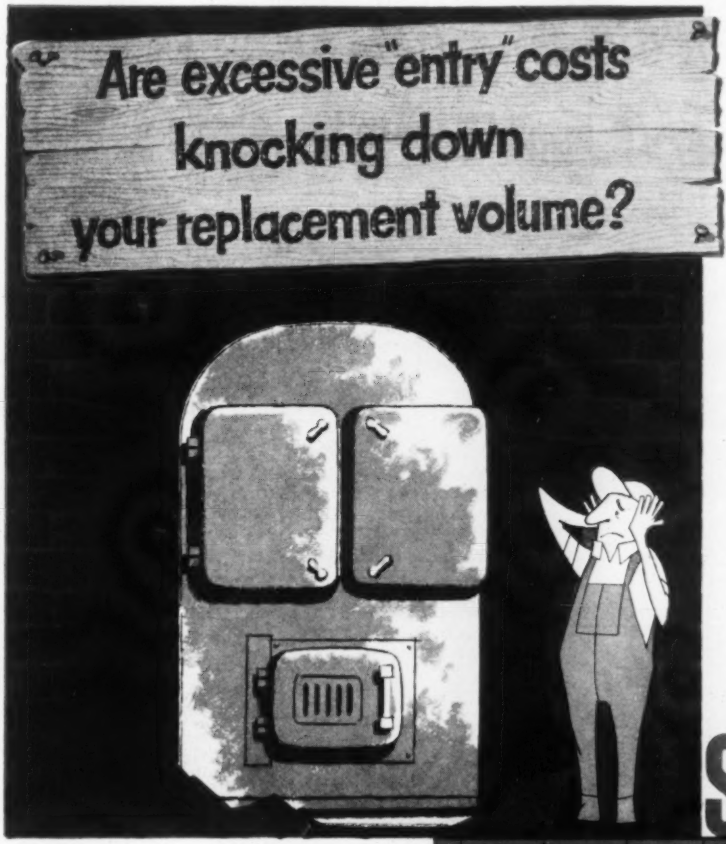
Engineering data showing how to determine sewage ejector capacities for any type or size of building are now available. Write to Dept. A for your copy today.

CHICAGO PUMP COMPANY
Subsidiary of Food Machinery and Chemical Corporation
BUILDING and INDUSTRIAL DIVISION
622 DIVERSEY PARKWAY • CHICAGO 14, ILLINOIS

Condo-Vac, Sure Return, AVC, LVC,
Fire, House & Circulating Pumps
Pneumatic & Tankless Water Systems.

Flush-Kleen Sewage Ejectors
Little Giant & Non-Clog Bilge Pumps
Pumps for every industrial use.

fmc
FOOD MACHINERY AND CHEMICAL CORPORATION ®


Are excessive "entry" costs knocking down your replacement volume?

Just think how many customers in your area would replace their worn-out boilers if it weren't for excessive installation costs. *You can get these jobs* if you . . .

install the unique

SPENCER "LW"

Built in two sections – permits easy entry through narrow basement openings. No tearing out of walls. The two watertight sections can be moved in separately, yet require no welding for installation.

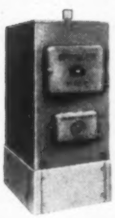
Lower waterline – over-all height of the Spencer "LW" is approximately 25% less than conventional firebox boilers . . . makes possible use in low ceilinged basements . . . and therefore saves excavation expense!

Let Spencer build up your boiler business—write Dept. HP-55

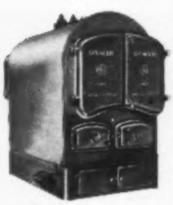
SPENCER
HEATER
LYCOMING DIVISION
WILLIAMSPORT AVCO PENNSYLVANIA

ASME and SBI Approved

OTHER COMMERCIAL BOILERS
IN THE SPENCER LINE



New Spencer "C." Heavy-duty commercial boiler performance at a residential boiler price! Can be fired with oil, gas or coal.



Spencer "A." Complete range of sizes from 3,500 to 50,000 sq. ft. steam, net SBI ratings. For *every* building . . . for *every* fuel.

For multi-room air conditioning…

New smaller UniTrane Units

Everything you asked for in a completely new line, completely new design — the new Trane UniTrane air conditioning units! In 4 new sizes, 4 completely new models . . . same capacities but reduced dimensions!

You asked for a smaller, more compact cabinet. And the *new* UniTrane's got it! The *smallest* cabinet in UniTrane history. A scant *2¼ sq. ft.* floor area for the smallest unit. All models are surprisingly compact . . . save space, allow greater design freedom.

You asked for a new "slim look." And the *new* UniTrane's got it! The vertical model over-all depth—*9 inches slim!* Or *25% slimmer* than previous models. Hugs the wall—for clean, modern room design.

You asked for a low silhouette. And the *new* UniTrane's got it! The low, *low* look . . . vertical cabinet model is only 25 inches high. Top edge comes *below* the window line!

You asked for "whisper quiet" operation. And the *new* UniTrane's got it! Low coil face velocity is the reason. That means air is moved *gently* . . . without whistle, whine or wheeze!

. . . now 25% slimmer!

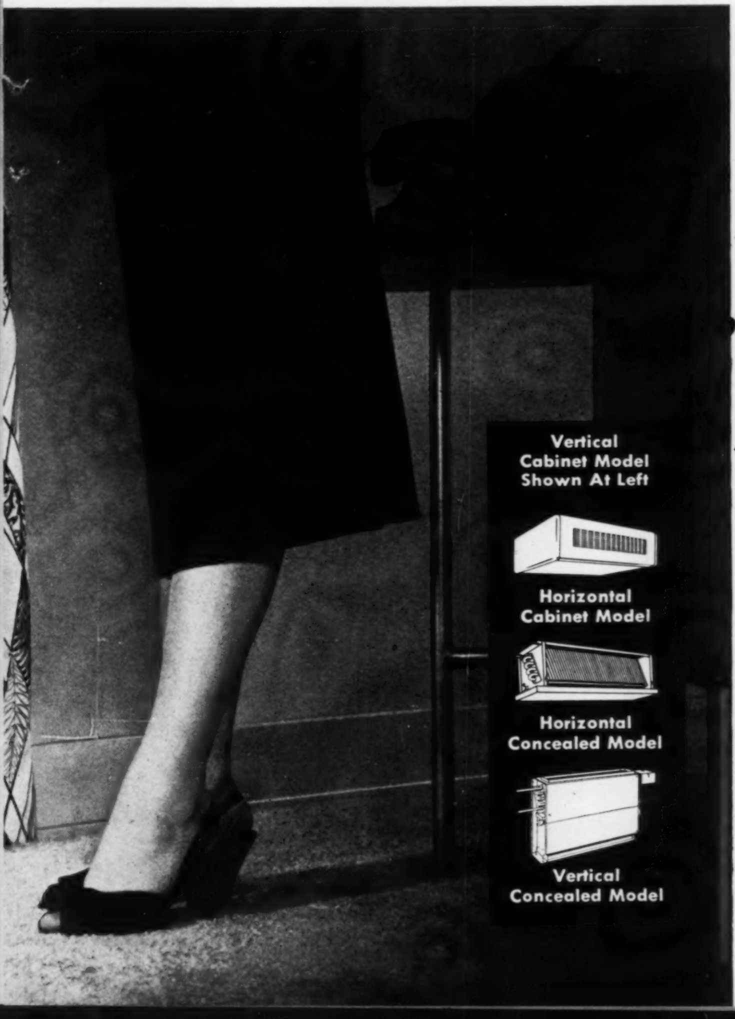
You asked for even greater flexibility. And the *new* UniTrane's got it! Round-edge end panels on cabinet model may be removed to facilitate butting unit to shelving. Rubber seal bonds unit to wall . . . gives free-standing models that built-in look. And the 4 new models—*each in 4 sizes*—that means you fit the air conditioning to the building . . . *not* the building to the air conditioning!

For year 'round comfort, plus outstanding beauty and operating efficiency, UniTrane is your answer. Single pipe circuit provides hot water for winter heating, cold water for summer cooling.

Want the Facts?

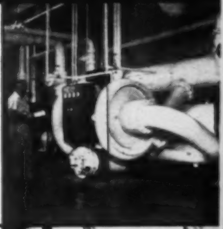
Get your advance copy of the new bulletin giving full particulars on the beautiful new UniTrane line. Just contact your nearest TRANE Sales Office or write TRANE, La Crosse, Wisconsin.

Furniture by Midwest Furniture Showrooms, Mpls.

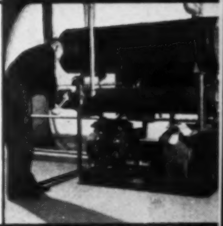

Vertical Cabinet Model Shown At Left
Horizontal Cabinet Model
Horizontal Concealed Model
Vertical Concealed Model

SPECIFY TRANE MATCHED EQUIPMENT

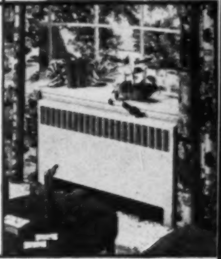
CenTraVac hermetic centrifugal compressor. Only one major moving part. Starts, stops, runs unattended. Automatically adjusts capacity and horse power from 100% to 10% of load.



Cold Generator is the packaged water chiller for smaller installations. Engineered, built, tested and refrigerant-charged at factory. 10 to 100 tons.



Convectors replace bulky radiators when it is desired to leave existing heating system intact and use transom model UniTrane units for cooling only.



one source • one responsibility

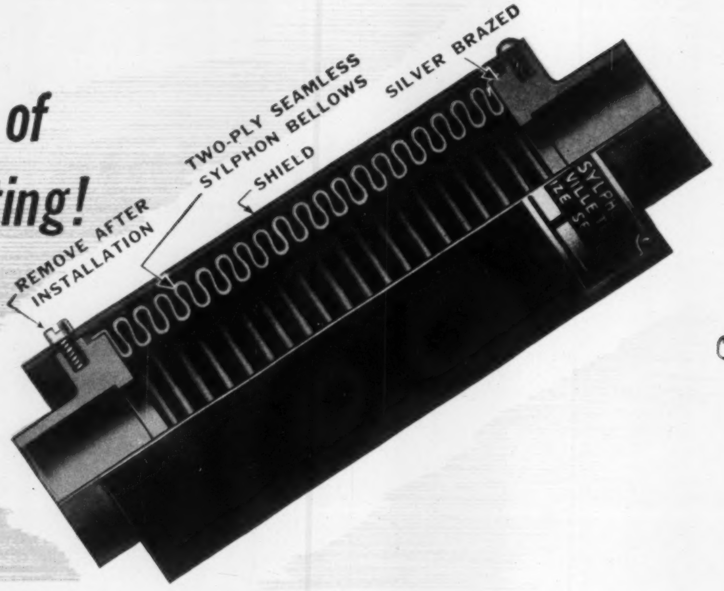
TRANE

MANUFACTURING ENGINEERS

One source, one responsibility for:
Air Conditioning • Heating • Ventilating
Heat Transfer Equipment

The Trane Company, La Crosse, Wis. • Eastern Mfg. Div., Scranton, Pa. • Trane Co. of Canada, Ltd., Toronto
90 U.S. and 17 Canadian Offices

Absorbs expansion of "baseboard" heating!


REMOVE AFTER INSTALLATION
TWO-PLY SEAMLESS SYLPHON BELLOWS
SHIELD
SILVER BRAZED
SYLPH
VILLE T
ZE SF

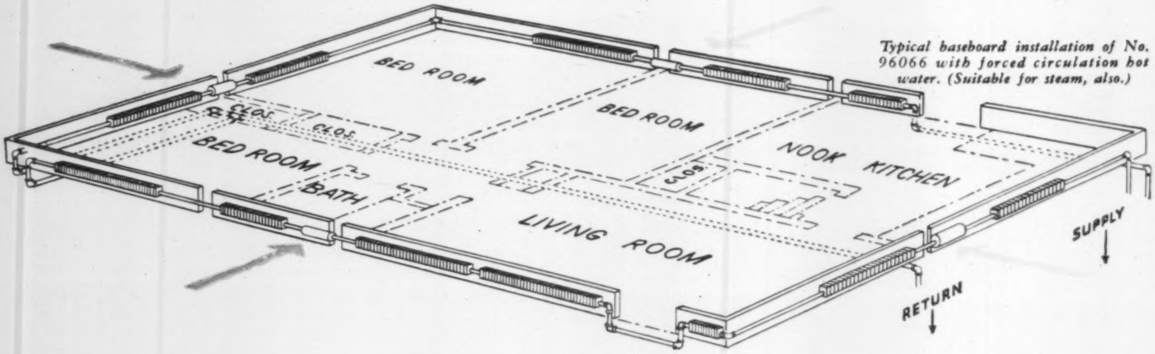
SIMPLE AND COMPACT—
minimum parts

EASILY INSTALLED—
factory pre-assembled, ready to use

LEAKLESS—
phosphor deoxidized copper bellows replaces packing, prevents leaks

LOW COST

New SYLPHON Packless Expansion Joint No. 96066


BED ROOM
CLOS
CLOS
BED ROOM
BED ROOM
BATH
CLOS
NOOK
KITCHEN
LIVING ROOM
SUPPLY
RETURN

Typical baseboard installation of No. 96066 with forced circulation hot water. (Suitable for steam, also.)

This new Sylphon Packless Expansion Joint, No. 96066, provides a simple means for absorbing expansion of "baseboard" radiation, finned tube convectors, horizontal supply lines, etc. It is ideal for both hot water and steam heating lines.

Pre-assembled at the factory, Sylphon Packless Expansion Joint No. 96066 is easy to install — horizontally or vertically. It can also be removed easily from the line. Sturdily built of corrosion-resistant materials to assure long, trouble-free service. Write for bulletin that gives full details about sizes, pressure limits, etc. Ask for Catalog JH-E.

Robertshaw-Fulton
CONTROLS COMPANY

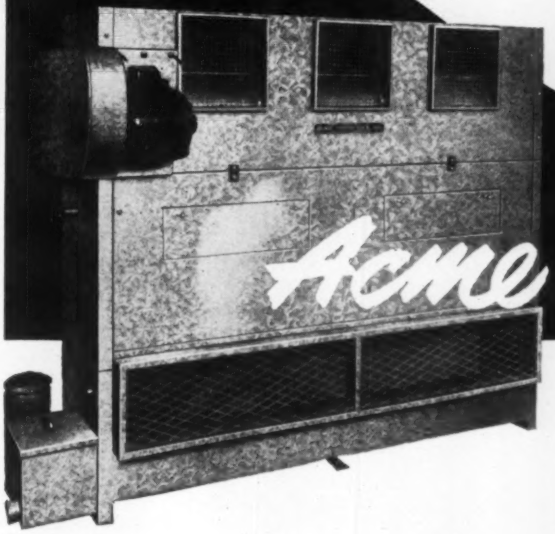
FULTON SYLPHON DIVISION • KNOXVILLE 1, TENN.

hot-dip every inch galvanized steel

for longer life and top performance

The unsurpassed durability and maintenance-free life of Acme Cooling Towers results from the strict attention to detail long associated with Acme production and engineering. First, Acme Cooling Towers are constructed of heavy-gauge steels for maximum, rigid strength. Then after the unit is completely fabricated, the tough weather-resistant hot-dip galvanized finish is bonded to enable the unit to withstand the most severe weather conditions.

This permanent bond of zinc actually adds to the metal thickness and structural strength of this Acme all-steel unit. There is not a particle of wood in the unit to rot. There are no painted surfaces to rust away or require repainting. There is only this durable, all-steel, permanently protected unit to give you more years of peak performance.



COOLING TOWERS

Add to the rugged durability of Acme Cooling Towers all these extras and you understand why they are first in their field. Exterior-mounted, over-size ball bearings; integrally-mounted, custom designed pump; external sump — easily accessible for servicing; conveniently located water treatment basket; removal sediment screen; an automatic waste, drain and overflow; quiet-running, constant velocity blowers; weather protected blower motor; non-clogging low-pressure nozzles; adaptable for front, top, or rear discharge; large convenient access doors; wetted metal deck principle — fastest heat transfer.

Capacities range from 15 to 70 tons. Smaller capacities are available in the equally rugged and efficient Acme Flow-Cold Cooling Towers, 2 to 15 tons.

ACME INDUSTRIES, INC.
JACKSON, MICHIGAN

Manufacturers of Quality Air Conditioning and Refrigeration Equipment since 1919

- Evaporative Condensers
- Cooling Towers — 2 to 70 tons
- Blo-Cold Unit Coolers
- Dry-Ex (Direct Expansion,) Liquid Chillers
- Shell-and-Tube, Shell-and-Coil Condensers
- Flow-Cold packaged Liquid Chillers to 15 tons
- Flow-Therm packaged Liquid Chillers to 220 tons
- Heat Exchangers
- Liquid Receivers
- Flow-Temp Heat Pumps
- Remote Room Conditioners
- Oil Separators

save water with *Acme*

☐ Acme Catalog on large capacity cooling towers
☐ Acme Catalog on Flow-Cold cooling towers
☐ Acme Catalog on Evaporative Condensers

Name ....
Company ....
Address ....
City .... State ....

LEADERS RELY ON LAU

FOR SUPERIOR DIRECT DRIVE BLOWERS

Lau Direct Drive Blower

THE COMPLETE BLOWER PACKAGE

No belts, **no** pulleys, **no** expensive motors to buy! This Blower has enabled several furnace and air conditioning manufacturers to **save from $4 to $6 per unit** on their equipment costs, without sacrificing efficiency or performance. A compact, efficient, and inexpensive co-ordinated unit —built into your product quickly and easily. Principal features:

Sizes from DD7 through DD9. Capacities up to 1200 cfm. Standard motors are shaded-pole type; 6 pole, 115V, 60 cycle, AC. Motors of ⅛ or ⅙ hp available for DD9 models; 1/10 hp for DD7 only. **Lau** adjustable motor mounting bracket permits fitting of motors from several different motor manufacturers; thus complete freedom in motor source selection. Standard blower assembly consists of blower wheel, housing with cut-off, and motor. Motor assembled in mounting with Neoprene mounting cushions; or standard resilient motor mountings available. **Lau Direct Drive Parts Package**—for customers desiring to purchase motors direct, Lau offers a complete parts package of every item needed, except motor, to complete the blower. Easy to handle, packaged 4 per carton, extremely low priced.

Put your Problems up to Lau

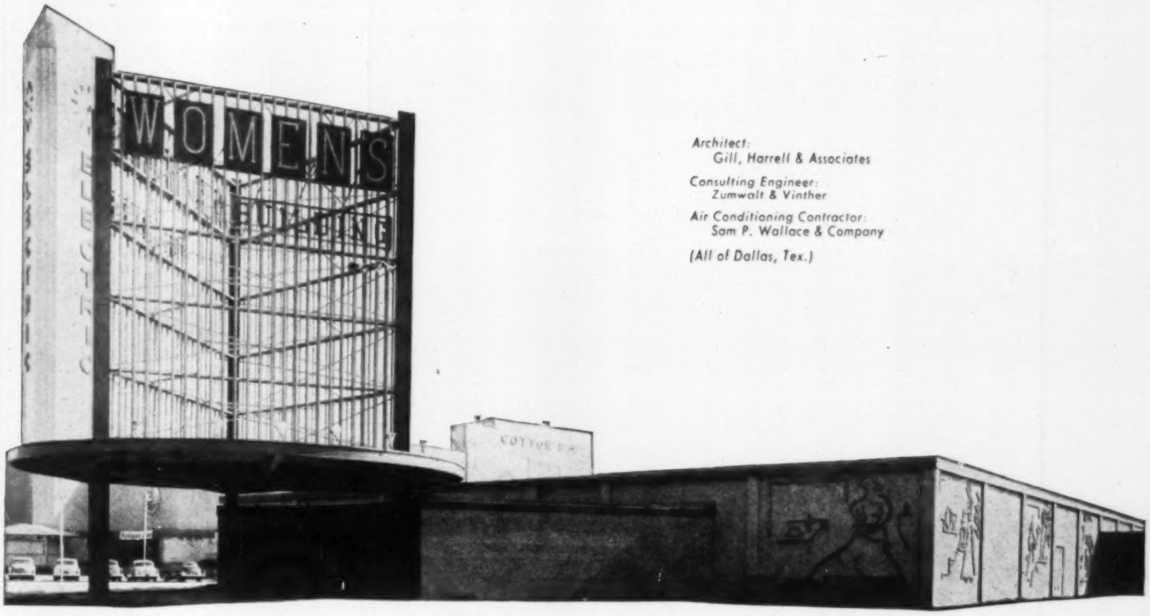
Our engineering experience is at your disposal. Write for **Lau** Blower Catalog 707.

LB-2-55

THE LAU BLOWER COMPANY • 2112 Home Avenue, Dayton 7, Ohio

In Canada • The Lau Blower Company of Canada, Ltd., Kitchener, Ont., Canada

LAU World's Largest Manufacturer of Air Conditioning Blowers



Architect:
Gill, Harrell & Associates

Consulting Engineer:
Zumwalt & Vinther

Air Conditioning Contractor:
Sam P. Wallace & Company

(All of Dallas, Tex.)

Marlo cools a king-size building in the lone star state

PELLON
PELLON

Whether YOUR air conditioning problem is large or small, you'll find a practical solution in the complete line of Marlo equipment.

The biggest air-conditioned banquet area in the Southwest, on the grounds of the biggest state fair in the world, in the biggest state in the Union.

There's a "superlative" description of the Women's Activities Building on the Texas State Fair Grounds, in the shadow of the famous Cotton Bowl at Dallas.

The scene of international displays at Fair time, and of innumerable conventions and banquets throughout the year, this massive structure demands an air conditioning system of great capacity and flexibility to offset the widely varying heat loads.

These cooling requirements are met with a series of Marlo Ceiling Type Air Handling Units — compactly designed and unobtrusively installed to provide the greatest cooling efficiency in the least amount of space.

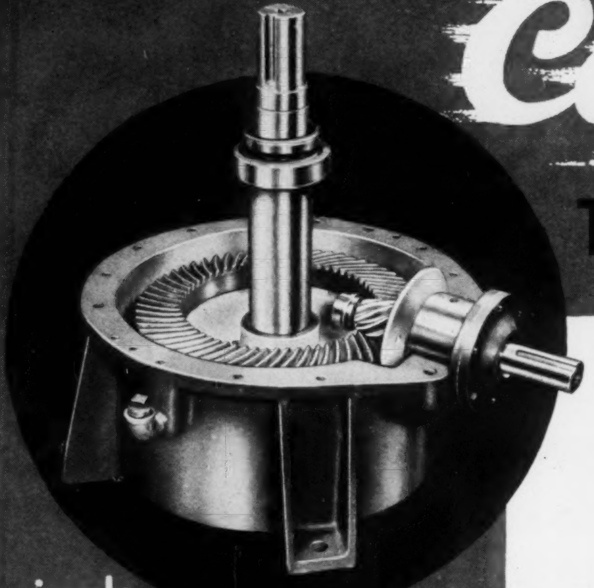
Marlo

COIL COMPANY

Manufacturers of COOLING TOWERS • EVAPORATIVE CONDENSERS • INDUSTRIAL COOLERS • AIR CONDITIONING UNITS • MULTI-ZONE UNITS • BLAST HEATING & COOLING COILS

Saint Louis 10, Missouri

Spiral-Bevel Cooling TOWER DRIVE



Here are features which make these single reduction Spiral-Bevel Units outstanding:

- High Efficiency . . . 97, 98% with small heat loss.
- Precision generated Spiral-Bevel Gears, case hardened for long service life.
- Heavy duty housing construction.
- High dome permits mounting fan directly on unit, with ample clearance below fan blades.
- Spiral-bevel pinion is supported by additional outboard bearing, thus preventing any possible pinion deflection.
- Oversize bearings give extra long life.
- Top bearing is continually flooded with oil—no grease fittings are necessary.
- Economical to operate.
- Reducer meets all AGMA standards.

These widely used Cooling Tower Drives are made in 5 sizes, rated from 15 h.p. to 75 h.p. at 1750 r.p.m. motor speed, with Ratios ranging from 3½ to 9½:1.

Be sure your next Cooling Tower is equipped with this dependable Philadelphia Drive. Literature upon request.

simple
compact
sturdy
efficient

PHILLIE GEAR
UNIT 3425 CT

Write for Catalog CT-53, which illustrates and fully describes all types of Philadelphia Cooling Tower Drives and their applications: Spiral Bevel, Helical-Spiral Bevel and Worm Gear.

PHILADELPHIA
COOLING TOWER DRIVES

PHILADELPHIA GEAR WORKS

PHILADELPHIA GEAR WORKS, INC.

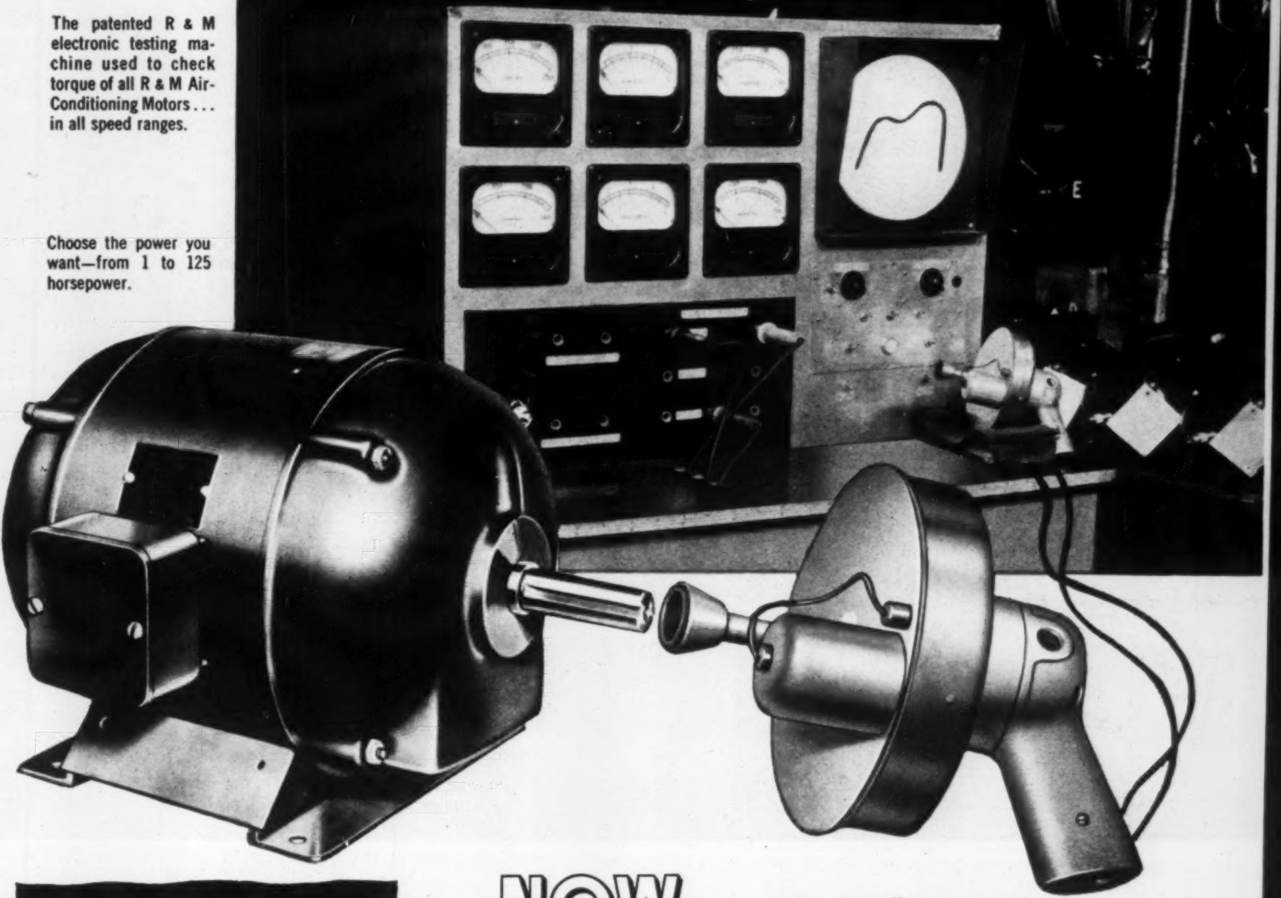
ERIE AVE. AND G ST., PHILADELPHIA 34, PA.
NEW YORK • PITTSBURGH • CHICAGO • HOUSTON • LYNCHBURG, VA.
Virginia Gear & Machine Corp., Lynchburg, Va.

Industrial Gears & Speed Reducers

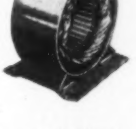
LimiTorque Valve Controls
ESTABLISHED 1892

The patented R & M electronic testing machine used to check torque of all R & M Air-Conditioning Motors . . . in all speed ranges.

Choose the power you want—from 1 to 125 horsepower.



"Weatherized" inside and out—
AT NO EXTRA COST!



Steel parts undercoated with baked-on "Robbinite."

Rotor and shaft assembly sprayed with special rust inhibitor.

Cast-iron parts get special anti-corrosion treatment.

Terminal box—cast-iron—gasketed; leads sealed. Repellent grease keeps moisture out of bearings.

NOW ...get the torque YOU want...by specifying ROBBINS & MYERS!

R & M motors have not only the right construction features for air-conditioning service, but the right *torque characteristics* as well.

That's because we have completely eliminated guesswork in determining the starting and acceleration performance of our induction motors. Tested by a unique electronic machine over the entire speed range, each motor *shows* its own *complete* accelerating curve, including that part which is almost impossible to obtain by other methods.

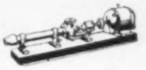
For you, this means your R & M motor will not "hang up" at some low speed—the "dips" have been designed out. And this patented speed-torque tester proves it!

And, here's something you'll want to know about *installation*. You can reconnect—*on the job*—all R & M standard 220/440 volt motors for 220 volt part-winding increment starting. Thus, only half normal starting current is drawn—without need for autotransformers or resistors.

Want more details? Write for Bulletin 400HP, showing all the advanced construction features of R & M motors. It costs you nothing, of course, to find out about the finest air-conditioning motor your money can buy!

ROBBINS & MYERS, INC.
MOTOR DIVISION · SPRINGFIELD, OHIO · BRANTFORD, ONTARIO

Fractional & Integral H.P. Motors & Generators

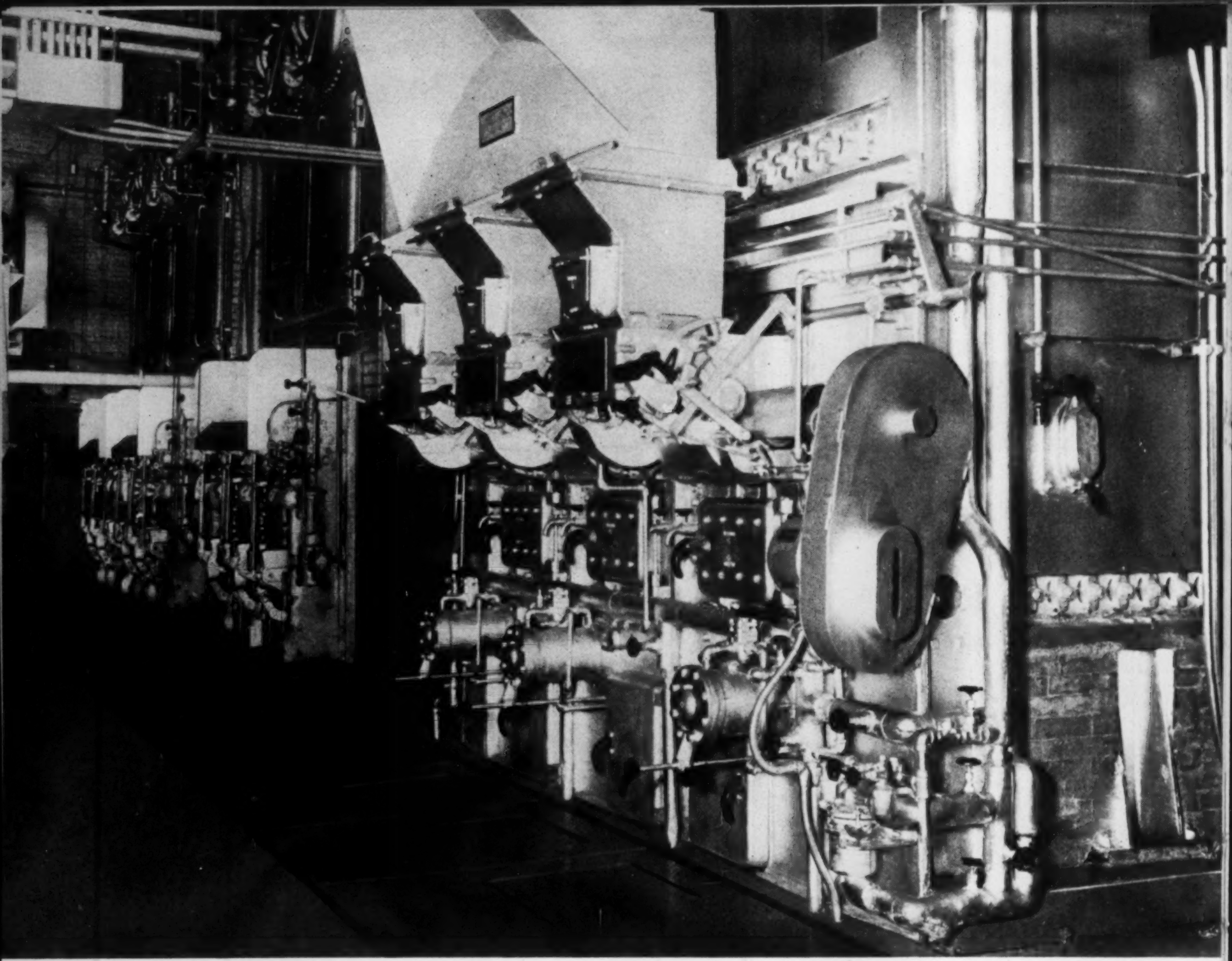


Moyno Pumps

Propellair Industrial Ventilating Equipment

Electric Fans

Electric & Hand Hoists & Cranes



For efficiency and economy of operation, Liggett & Myers burns coal the modern way

In 1952, the steam demand of the Liggett & Myers Tobacco Co., Richmond, Va., had developed to the point where additional capacity was needed. The firm of Lockwood Greene Engineers, Inc., retained by Liggett & Myers to study the situation, recommended installing modern, automatic coal burning equipment to operate in conjunction with the original boilers. The equipment was installed.

The results have been extremely gratifying. The boiler plant now maintains constant pressure under high steam demand, the steam coal rate has increased 4.1 and there have been no operating difficulties. In addition, other benefits include reduction of labor, satisfactory air pollution control and improved performance records.

Investigate Your Fuel Costs

If you're planning to modernize your plant or build a new one—or if you are just interested in cutting fuel costs—find out how coal, burned the modern way, compares to other fuels. Talk to a consulting engineer or your nearest coal distributor. Their advice may save you thousands of dollars every year.

facts you should know about coal

In most industrial areas, bituminous coal is the lowest-cost fuel available.

Up-to-date coal burning equipment can give you 10% to 40% more steam per dollar.

Automatic coal and ash handling systems can result in a virtually labor-free plant.

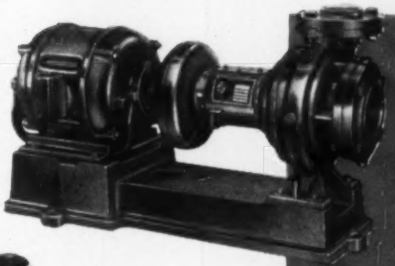
Coal is the safest fuel to store and use. No dust or smoke problems when coal is burned with modern equipment.

Between America's vast coal reserves and mechanized coal production methods, you can count on coal being plentiful and its price remaining stable.

For further information or additional case histories showing how other plants have saved money burning coal, write to the address below.

NATIONAL COAL ASSOCIATION
Southern Building, Washington 5, D.C.

Depend on B&G FOR HEATING . . . COOLING . . . AND PUMPING WATER



B&G BOOSTER AND UNIVERSAL PUMPS
Catalog GK-954

Specifying "B & G" throughout for water heating systems, air conditioning and refrigeration installations assures you of equipment known for quality—with a single manufacturer's responsibility for satisfactory operation.

If you haven't a complete file of the B & G literature shown here, write today.

B&G CENTRIFUGAL PUMPS

B & G Boosters and Universal Pumps cover a complete range of heads and capacities for forced hot water heating and service water systems. Noted for *quiet* operation!

For air conditioning, refrigeration and industrial applications, B & G 1522 and 1531 Pumps have a long record for dependable and economical performance. All pumps illustrated feature the B & G Leak-proof Mechanical Seal.

B&G EVAPORATOR

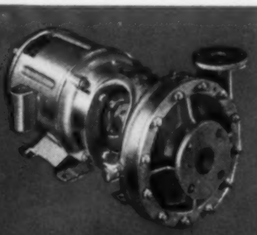
You'll find *plus value* in the unique design of this evaporator which prevents oil-trapping in the head passes. Steel legs are movable for easy mounting—shell connections extend well beyond the insulation cover. ASME Code constructed.

B&G CONDENSERS

Rugged, precision-built units of time-tested design provide top performance over a long service life. Built to ASME Code.

HEAT EXCHANGERS

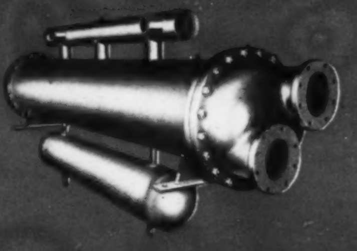
Easy now to select equipment for water-to-water and steam-to-water heat transfer applications. B & G Type "SU" and "WU" Heat Exchangers are rated for instantaneous heating of water for service use—radiation—snow melting panels—swimming pools—boiler feed—storage tanks and process work. Many commonly used sizes of "SU" and "WU" Exchangers are available immediately from factory stock.



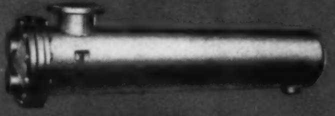
B&G 1531 CENTRIFUGAL PUMPS
Catalog ET-452

B&G 1522 CENTRIFUGAL PUMPS
Catalog GA-754

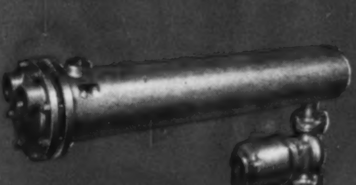
B&G EVAPORATORS
Catalog FX-454



B&G CONDENSERS
Catalog FZ-454



B&G TYPE "SU" HEAT EXCHANGER
Steam-to-water
Catalog GN-1054

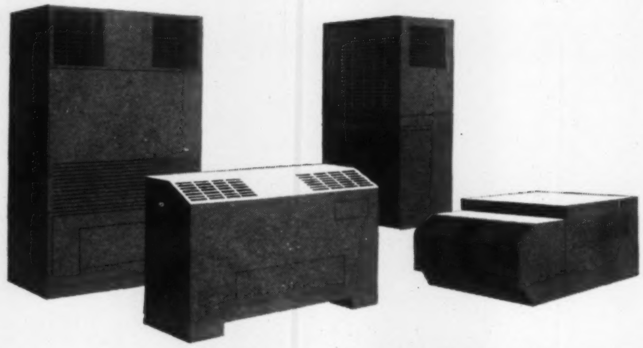


B&G TYPE "WU" HEAT EXCHANGER
Water-to-water
Catalog GC-1054

BELL & GOSSETT
COMPANY
Dept. DW-5,. Morton Grove, Illinois
Canadian Licensee: S. A. Armstrong, Ltd., 1400 O'Connor Drive, Toronto

this daisy

will help you sell more air conditioners



It's the symbol of United States Steel's national air-conditioning promotion

WRITE FOR FREE DISPLAY MATERIALS

2 Big Window Streamers. These big 44″ high x 14″ wide banners bearing the daisy symbol and the campaign theme will quickly identify your store with the national promotion. Use them in window and department displays.

Merchandise Tags. Bear a 2-color daisy symbol and the campaign theme. Attach tags to air conditioners in floor and window displays. These 2″ x 5″ tags are available in packages of 50.

Symbol Reproduction Proof. This 12″ x 18″ sheet shows how to reproduce the official daisy symbol in black and white and in 2-colors for use in newspaper advertising, direct mail, car cards, point-of-sale material, television, window displays, 24-sheet posters, magazine ads, and house organs.

This fresh-as-a-daisy promotion is certain to make your air conditioner sales blossom. The campaign breaks with 4-color ads in Life and Time magazines (June 20 and June 13). These ads, featuring the daisy symbol and the promotion theme—"Turn on Spring . . . all year 'round" —will tell readers how to make their homes, stores and offices havens from heat. On the coast-to-coast TV show, The U.S. Steel Hour, Mary Kay and Johnny will sell air conditioning to millions of viewers.

Order display materials now!

WRITE TO:
Robert C Myers
Director, Market Development Division
UNITED STATES STEEL
525 William Penn Place, Pittsburgh 30, Pa.

UNITED STATES STEEL

AMERICAN BRIDGE • AMERICAN STEEL & WIRE and CYCLONE FENCE   COLUMBIA-GENEVA STEEL • CONSOLIDATED WESTERN STEEL • GERRARD STEEL STRAPPING • NATIONAL TUBE
OIL WELL SUPPLY • TENNESSEE COAL & IRON • UNITED STATES STEEL PRODUCTS • UNITED STATES STEEL SUPPLY . . . *Divisions of* UNITED STATES STEEL CORPORATION, PITTSBURGH
UNITED STATES STEEL HOMES, INC.   UNION SUPPLY COMPANY • UNITED STATES STEEL EXPORT COMPANY • UNIVERSAL ATLAS CEMENT COMPANY

KENNARD *Engineered*

KT WATER SAVERS

with CENTRIFUGAL TYPE FAN for quiet Indoor Operation

KENNARD KT Water Savers—Engineered for Long Life.

Compare these outstanding features. Centrifugal fan, Redwood wetted deck, Galvanized construction throughout—Brass and Bronze trim.

Compact, quiet—place it in your home. Efficient, rugged—for outdoor commercial use. *In stock—order yours now!*

INDOOR or OUTDOOR, sized to meet your requirements. 3, 5, 8, 11 and 16 ton capacities. Contact your Kennard Agent. Ask for **Catalog KT-2.**

For larger applications—Kennard Cooling Towers, capacities of 20 through 75 tons—ask for **Catalog CT-1.**

•

for use with ALL MAKES of WATER COOLED Air Conditioners

•

Representatives in all Principal Cities

Ala., Birmingham	Palmer & Lawrence
Ariz., Phoenix	O. K. McCullough Co.
Ark., Little Rock	Mullins Engineering Co.
Calif., Los Angeles	Robt. B. Holland Co.
San Francisco	Robt. B. Holland Co.
Colo., Denver	Wallace A. Henry
District of Columbia	Neviaser & Hoddinott
Fla., Clearwater	R. J. Clark Equipment Co.
Jacksonville	R. J. Clark Equipment Co.
Miami	R. J. Clark Equipment Co.
Ga., Atlanta	Engineered Products Co.
Ill., Chicago	Z. M. Prane Company
Peoria	Carl J. Vespasian Company
Ind., Ft. Wayne	Paller Engineering Co.
Indianapolis	Paller Engineering Co.
Iowa, Des Moines	Elwood C. Giberson
Kans., Wichita	Ray F. Bauer
Ky., Louisville	Olan J. Hill Co.
La., New Orleans	Wm. H. Dudley, Jr.
Shreveport	Wm. H. Dudley, Jr.
Md., Baltimore	John J. Barry
Mass., W. Roxbury	The Airadyne Company
Mich., Detroit	David S. Falk Company
Minn., St. Paul	J. Fuller Stafford & C. L. Bensen
Mo., Kansas City	Engineered Equipment Co.
St. Louis	R. H. Spangler & Co., Inc.
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New York, Buffalo	V. N. Harwood Company
Cazenovia	Lewis Reid
New York	Assoc. Thermal Products, Inc.
N. Carolina, Charlotte	Chet Adams Company
Greensboro	Chet Adams Company
Raleigh	Chet Adams Company
Ohio, Akron	Slawson Equipment Company
Cincinnati	F. W. Jenike Company
Cleveland	Slawson Equipment Company
Dayton	Frey Equipment Company
Toledo	Robt. I. Fruth Company
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Penn., Norristown	John R. Ellstrom & Associates
Pittsburgh	Harris Sales Company
Tenn., Knoxville	Ferguson Equipment Company
Memphis	R. H. Spangler & Co., Inc.
Nashville	Ferguson Equipment Company
Texas, Dallas	Rodgers Engineering Co., Inc.
El Paso	Phillips-Moore Equipment Co.
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San Antonio	R. S. Ryden & Company
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Richmond	Chet Adams Company
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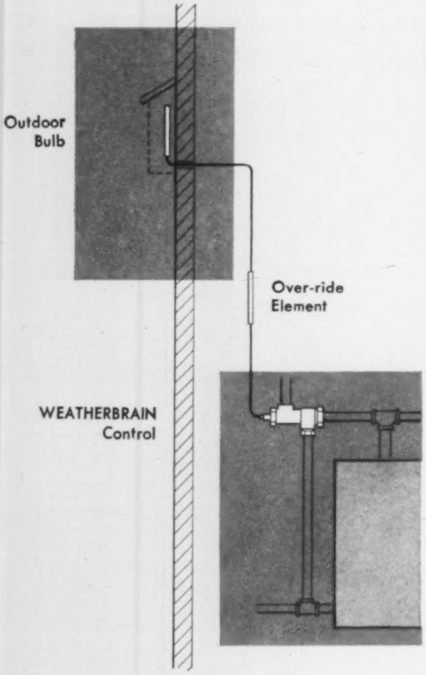
KENNARD CORPORATION
1817 HANLEY RD. • ST. LOUIS 17, MO.

Inexpensive

DETROIT *All Weather* CONTROL



WEATHERBRAIN Control...

for forced hot water heat

IT'S ALL MECHANICAL

Weatherbrain is a *profitable, easily installed* weather-sensitive control.

It varies the water temperature to the radiation; automatically keeps indoor temperature constant when outside temperature changes.

Instant response to weather changes . . . no delay as in other types of control systems.

Very efficient on zoned installations as well as single systems. The Weatherbrain Control is rugged and foolproof!

Talk to your DETROIT CONTROLS Wholesaler *today* . . . or write for Bulletin 254.

DETROIT CONTROLS CORPORATION
5900 TRUMBULL AVE. • DETROIT 8, MICHIGAN
Division of AMERICAN RADIATOR & STANDARD SANITARY Corporation

Representatives in Principal Cities • Canadian Representatives:
RAILWAY AND ENGINEERING SPECIALTIES, LTD.,
Montreal, Toronto, Winnipeg.

AUTOMATIC CONTROLS *for* REFRIGERATION
AIR CONDITIONING • DOMESTIC HEATING • AVIATION • TRANSPORTATION • HOME APPLIANCES • INDUSTRIAL USES
Serving home and industry
AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS • SUNBEAM AIR CONDITIONERS

Ric·wiL *Serves*

620 Mile Pipeline

Here is REAL PROOF of Ric-wiL superior quality and performance... This recent installation of over 600 miles of pipeline represents a tremendous investment... and... a tremendous "vote of approval" for Ric-wiL systems.

Next time *you* specify piping... specify Ric-wiL and know you are getting the finest.

JUST OFF THE PRESS...

NEW Ric-wiL catalog is now available... write for your copy... today.

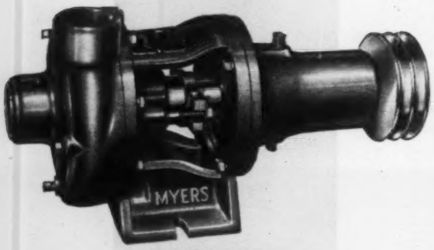
Quality Piping Systems...
...of Exceptionally High Thermal Efficiency

RIC·WIL INCORPORATED

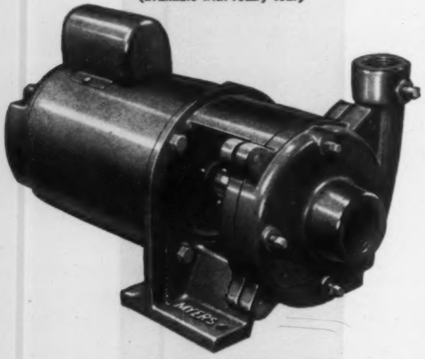
PREFABRICATED **INSULATED PIPING SYSTEMS**

BARBERTON, OHIO

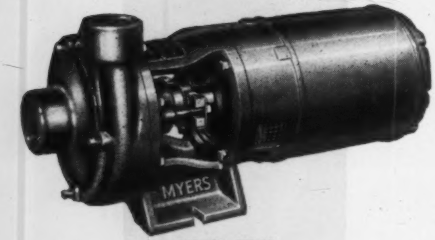
MODEL 100-B
Rotary seal only



MODEL 125-B
Shown with stuffing box
(available with rotary seal)



MODEL 100-M
Rotary seal only



MODEL 125-M
Shown with stuffing box
(available with rotary seal)

A Complete Line of Centrifugals for Air Conditioning from

MYERS

tops in pumps since 1870

FULL RANGE OF SIZES
⅓, ½, ¾, 1, 1½, 2, and 3 horsepower, motor-mounted or belt-driven models.

TWO CASING SIZES
1″ x 1¼″ or 1¼″ x 1½″.

ALL-BRONZE IMPELLER
Accurately balanced for smooth operation.

REMOVABLE BRONZE WEARING RINGS
Easily replaced for longer pump life.

ROTARY SEAL
Eliminates leakage (stuffing box may be specified on "125" models).

CORROSION-RESISTANT SHAFT
Stainless steel for trouble-free service.

WIDE RANGE OF CAPACITIES AND HEADS
Capacities to 90 GPM. Heads to 135 feet.

Write today *for Bulletin 210 on* **Myers** *Centri-Thrift Pumps.*

Myers **PUMPS** WATER SYSTEMS AND WATER SOFTENERS

The F. E. Myers & Bro. Co., Dept. HP-5, Ashland, Ohio

Here today......

AND HERE TOMORROW, TOO!

DURIRON
DURIRON

the permanent installation is

DURIRON ACID RESISTING DRAIN PIPE

Duriron is a high silicon iron alloy with a very high resistance to corrosion, abrasion and erosion. This resistance is present throughout the entire pipe wall.

Installed by ordinary plumbing methods, Duriron can be counted on to outlast the building, in most cases. Obviously, replacement and building repairs are virtually eliminated. Bulletin PF/4 lists complete details and standard fittings. Insist on *Duriron.*

A PARTIAL LIST OF RECENT DURIRON INSTALLATIONS

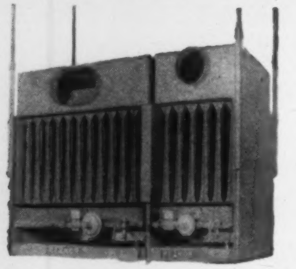
Roswell Park Memorial Institute, Buffalo, N. Y.
University of Texas Medical Center, Galveston, Tex.
Dorrance Laboratory, M.I.T., Cambridge, Mass.
Tippecanoe Laboratories,
Eli Lilly and Company, Lafayette, Ind.

THE DURIRON COMPANY, INC.
DAYTON, OHIO

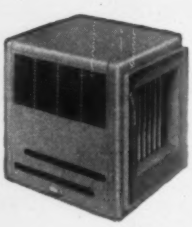
DURIRON
LOOK FOR THE NAME ON EVERY PIECE

There's a **Reznor** Gas Heater for Every Engineered Heating Job

Two NEW Duct Furnaces



SERIES DS — Systems with capacities in excess of two million BTU can be assembled, on the job, out of the four basic DS sections. Section capacities are 150, 200, 250 and 300 thousand BTU. The largest single section weighs only 315 pounds. Each section complete with combustion controls and built-in-draft diverter



SERIES D — Four sizes; 50, 75, 100 and 125 thousand BTU — compact, handsomely-styled units are complete with combustion controls and built-in draft diverter

for use in custom engineered heating and air conditioning systems

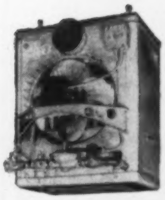
These two new models, though varying greatly in details of design and construction, have the same advantages of high efficiency and easy installation as an integral part of the duct system. And both offer complete flexibility for combination with components for air-moving, cooling, cleaning and humidification chosen to meet the exact requirements of each job.

Gas Unit Heaters

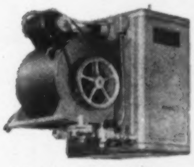
self-contained, completely automatic units for production and distribution of heat at the point of need.

Wherever you go you'll find Reznor heaters proving their versatility in all types of commercial, institutional and industrial buildings from tiny shops to huge factories and warehouses.

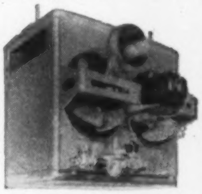
There are two reasons why nearly 50% of the gas unit heaters sold today are made by Reznor — engineering leadership and fine construction. Both have been Reznor traditions since the first Reznor heaters were made, in 1888. An aggressive research and production development program has kept Reznor ahead of the field with improvements for greater comfort or more heat per fuel and equipment dollar. And Reznor's high standards of workmanship and materials mean greater efficiency and longer life.



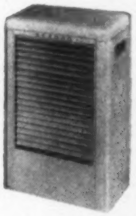
Propeller Fan Type Suspended Units—nine sizes; 25,000 to 250,000 BTU.



Blower Type Suspended Units—for use where quiet operation is a must — eight sizes; 25,000 to 200,000 BTU.



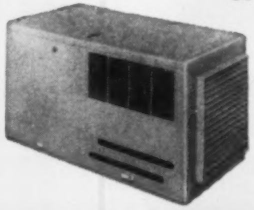
The New Reznor Twin Fan 250,000 BTU Model — another first for Reznor engineering.



Console-Styled Floor Models—for offices, stores and homes—three sizes; 25, 50 and 75 thousand BTU.

The Reznor PAC

compact horizontal furnace or deluxe unit heater



Compact design and appliance styling make the PAC ideal for crawl space and attic applications in residential heating or for suspended installations in basement, utility room or kitchen.

Used without ducts, the PAC becomes a deluxe unit heater which meets the most exacting requirements for cleanliness, quiet operation and fine styling.

REZNOR

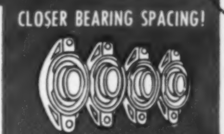
THE WORLD'S LARGEST-SELLING GAS UNIT **HEATERS**

Reznor Manufacturing Co.
51 Union Street, Mercer, Pa.

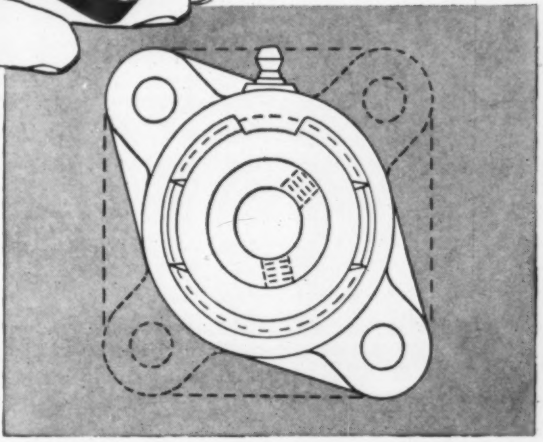
NOW! SEALMASTER

cuts corners to save DOLLARS for you!

SAVE FASTENERS!


CLOSER BEARING SPACING!

SAVE INSTALLATION TIME!



Check these facts!

- Cuts installation costs by eliminating two fasteners and punching or drilling operation required for two mounting holes.
- Permits closer bearing spacing on multiple shaft installations.
- As a replacement bearing unit fits the diagonal bolt centers on present four-bolt flange units.
- Carries the same load rating for a given shaft size as four bolt units.
- Retains all patented design features of SEALMASTER Bearing Units—Zone Hardening, Self-Alignment, Locking Pin & Perimeter Dimple and Labyrinth Seal.
- Available in shaft sizes from ½ to 2³⁄₁₆ inches.

New SEALMASTER 2-BOLT FLANGE UNIT

Call your SEALMASTER Distributor or mail this coupon today!

Please send Bulletin SS-125 containing full information on the new SEALMASTER 2-Bolt Flange Ball Bearing Unit.

NAME____________________

FIRM____________________

ADDRESS____________________

CITY__________ STATE__________

SEALMASTER
BALL BEARING UNITS

SEALMASTER BEARINGS A DIVISION OF STEPHENS-ADAMSON MFG. CO. • 47 RIDGEWAY AVE., AURORA, ILLINOIS

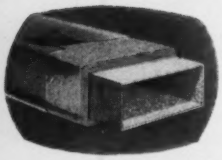
10 good reasons why ULTRALITE*

is your best buy in Duct Insulation . . .

1955 marks the *10th year* of duct insulation service for Ultralite, the long glass fiber insulation. More important, Ultralite that was put on ducts a decade ago shows no visible or measurable signs of deterioration today.

No other flexible glass fiber insulation can begin to match this performance record. So when you want insulation performance you can count on—and delivery you can count on—specify Ultralite, the only insulation of long textile-type glass fibers.

Distributors who carry local stocks of Ultralite are listed in the Yellow Pages in 57 cities. Call your nearby distributor, or write today for 8-page brochure.



ULTRALITE DUCT INSULATION
(Thermal)

It's "duct soup" to wrap air ducts with Ultralite Thermal Duct Insulation—it's as easy as wrapping a package! Ultralite Duct Insulation is available plain or with your choice of different vapor barrier facings, factory-applied to the insulation. Ultralite is non-irritating, pleasant to handle, fire-resistant and non-corrosive to metals. K-factor is very low—and so are applied costs!

ULTRALITE DUCT LINER
(Acoustical)

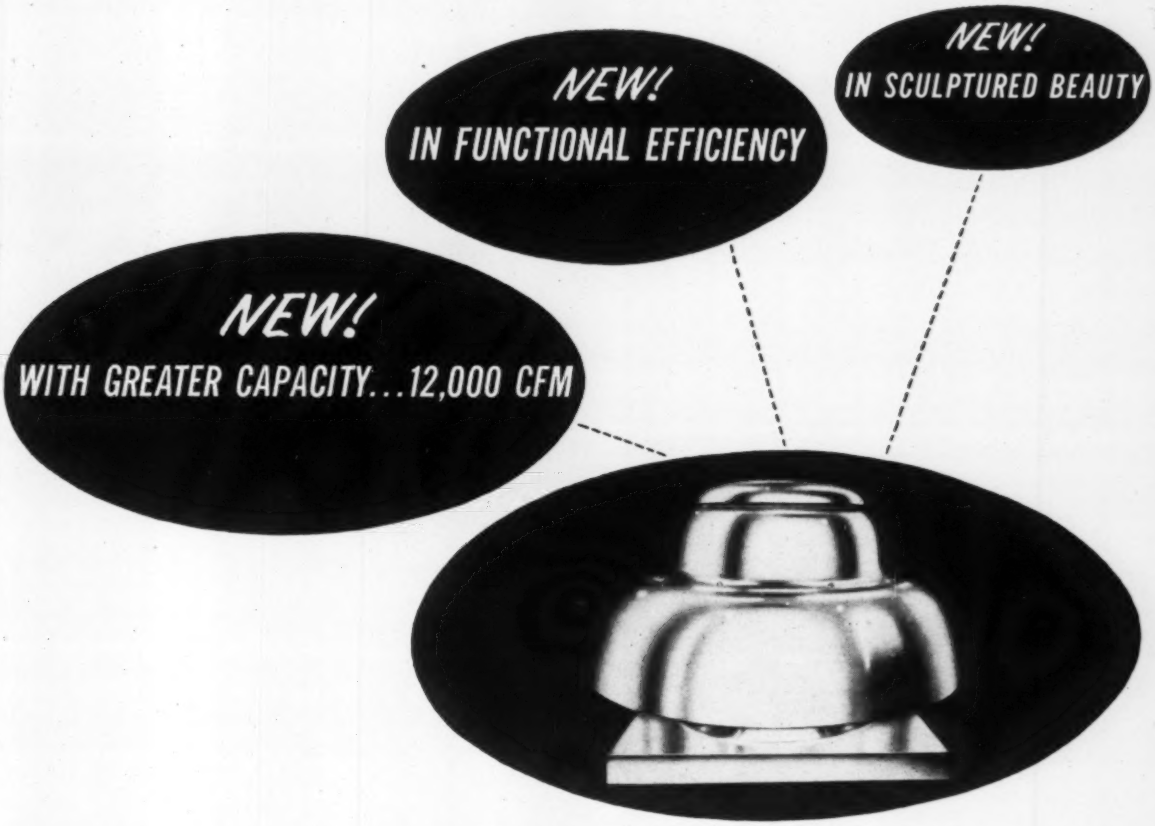
Ultralite Duct Liner is a flexible, semi-rigid glass fiber insulation designed specifically as an acoustical duct liner, with excellent sound-absorbing properties. It won't break, chip or delaminate—won't flake off in air stream! You can run it quickly around curves and corners, run it through the brakes and shears with the metal, fasten it in place with screws and washers or adhesives.

*Reg. U. S. Pat. Off.

GUSTIN-BACON *Manufacturing Company* GUSTIN gb BACON

220 W. 10th St., Kansas City, Mo.

Thermal and acoustical glass fiber insulations • Pipe couplings and fittings • Railroad gaskets and supplies



The NEW Jenn-Air BELT-DRIVE Centrifugal Roof Exhauster

Again leading the way, Jenn-Air provides a new innovation in spun all-aluminum belt-driven exhausters. With capacities up to 12,000 CFM, Jenn-Air becomes the first to offer these higher capacity belt driven exhausters with the same attractive low contour Jenn-Air designing. With Jenn-Air Belt-Drive Roof Exhausters, it is no longer necessary to use the unsightly industrial type ventilators to provide for those higher capacity requirements. *Certified ratings in accordance with NAFM and ASH&VE code tests by independent laboratory.*

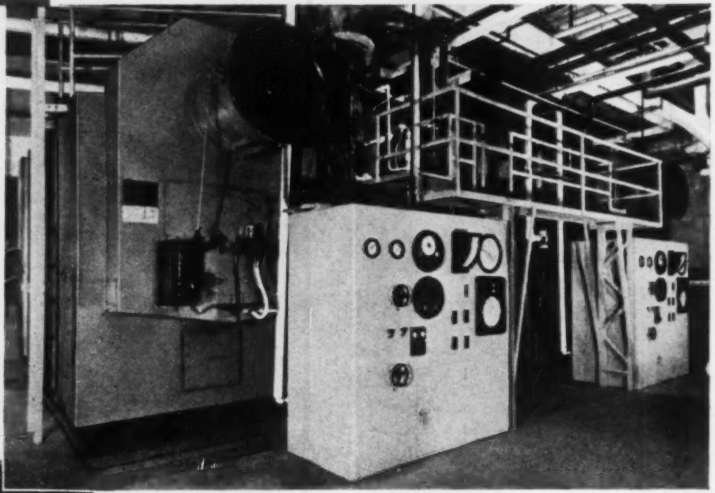
Look at these 7 ways Jenn-Air Exhausters excel:

1. Easy Installation—constructed from heaviest gauges of corrosion resistant aluminum, yet light enough for easy assembly on the roof;
2. Lower Fire Hazard—spark-proof blade—motor mounted out of air stream away from inflammable air contaminations;
3. Beauty—design that blends with today's modernistic buildings;
4. Ageless Aluminum Rustproof Construction—will outlast any structure—no painting required;
5. Quiet! full ball-bearing grease packed motor means dependable trouble-free operation;
6. Low Contour—hugs the roof for pleasing appearance . . . eliminating unsightly intrusion with roof line;
7. Package Unit—nothing else to buy . . . ready to install.

Jenn-Air also offers wall exhausters which can be installed close to the area needing ventilation, thus reducing duct work. Only Jenn-Air offers dual ventilation . . . both roof and wall exhausters.

JENN-AIR PRODUCTS COMPANY, INC.
Architects & Builders Building
Indianapolis 4, Indiana

keeping steam cheap . . .



"Home" of the two, B&W Type FM Integral-Furnace Boilers is in the basement of the Service Building. Francisco & Jacobus, Engineer & Architect for the Service Center.

2 B&W FM Boilers Serve 5 Buildings at

LONG ISLAND LIGHTING'S NEW SERVICE CENTER

With its residential load centered in an area where new home construction is booming, the Long Island Lighting Company has always anticipated load growth far in advance. The most recent example of this policy is the creation of the new service center in Hicksville, N. Y.

Covering 78 acres, the center includes a headquarters group of six buildings (providing 200,000 sq. ft. of floor space), huge storage facilities, parking space for almost a thousand cars, and even a helicopter landing strip. When three more planned buildings are completed, the center will contain about everything needed to operate the service end of a modern utility.

The steam requirements for all but one of the buildings is supplied by two B&W Type FM Boilers. Each unit is capable of generating 20,000 lb of steam per hr at 125 psi. Normally burning gas, the FM Boilers are equipped with combination burners and controls that permit changing over to oil in a matter of seconds and without substituting equipment. Automatic control, with on-off operation for low loads, is another important operational and economy feature of these versatile, self-contained boilers.

Satisfaction with the performance of B&W Integral-Furnace Boilers—both FMs and FFs—operating at other Long Island Lighting locations—was a strong factor in the choice of a dual-unit FM installation for the new service center. Along with other utilities and a broad range of industrial, commercial, and institutional users, Long Island Lighting has found the Type FM Boiler ideally suited to its needs. The strong acceptance of this unique boiler is indicated by the total steam capacity of more than 10,000,000 lb per hr of the units now in service or on order. It is available in standardized sizes for loads ranging between 2900 and 40,000 lb of steam per hr at pressures to 235 psi—may be obtained for higher pressures and with moderate superheat. *Write for Bulletin G-76A for the complete details of this unusual small boiler with an illustrated description of its cost-saving features. The Babcock & Wilcox Company, Boiler Division, 161 East 42nd Street, New York 17, N. Y.*

COST-SAVING FEATURES

- Saves Erection Time and Cost
- Meets Wide Range of Service
- Handles Quick Load Changes
- Fast Steaming
- Low Maintenance
- Easy Accessibility
- Suitable for Outdoor Service
- Burns Oil and/or Gas
- Saves Fuel
- Saves Space
- Safe, Automatic Operation

BABCOCK & WILCOX

BOILER DIVISION

G-702

THE EDITORS' PAGES

● *TWO OF THE BIGGEST news events of the last month or so were the trials of the atomic powered submarine, the Nautilus, and the success of the Salk polio vaccine. It's interesting to us that both these tremendous developments depend upon air conditioning. As explained some months ago in HPAC, the Nautilus couldn't stay submerged very long without its elaborate air conditioning and air purification systems. And — as explained in an article this month — production of the polio vaccine requires air conditioning, air filtering.*

Revising National Fire Protection Standard

. . . for oil burning equipment

SAFE INSTALLATION requirements for all oil burning equipment are outlined in the sweeping revision of the National Fire Protection Association Standard No. 31, being submitted for official adoption at the association's annual meeting on May 16-20. The revised standard covers clearances to combustible construction, installation of fuel pipes, amount of air needed for proper combustion, draft requirements, tank installations, and other items.

It also contains an extensive list of definitions aimed at achieving uniformity of terminology in the field.

The recommended revised text is available from the association offices, 60 Batterymarch St., Boston 10.

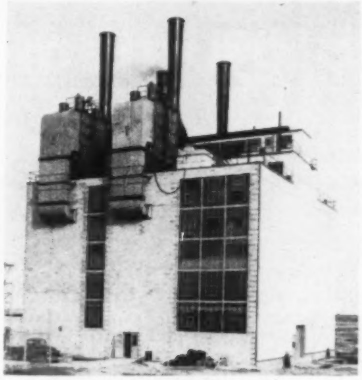
Room Air Conditioner Industry Sales To Top 1954

. . . predicts new record

INDUSTRY SALES of room air conditioners are expected to set a new record in 1955, according to James H. Carmine, president of Philco Corp. The forecast was made in a recent letter to stockholders.

"Few, if any, other industries have shown as rapid growth during the past five years as room air conditioners," Mr. Carmine said. He cited independent research figures to show that sales have increased from 200,000 units in 1950 to about 1,230,000 units in 1954, the record.

He described prospects for the 1955 season as "bright." In support of this, he said, "Our inventories of all air conditioning products are in good balance, and the number of units in our hands and those of our distributors is actually smaller than at this time a year ago."



HIGH TEMPERATURE WATER HEATING SYSTEM newly installed at McGuire Air Force Base has this 6000 hp, four boiler heating plant and 33 miles of underground piping

Air Base Gets New $4 Million Heating System

. . . high temperature water type

AN ULTRA-MODERN central heating system, costing $4 million, was recently completed at McGuire Air Force Base, Wrightstown, N. J., according to Charles Simkin & Sons, Inc., engineering contractors. Water at 420 F is circulated under pressure through 33 miles of underground piping to over 75 distant buildings, to supply precisely controlled heat, steam, and hot water.

Total heating capacity of the four boiler heating plant is 6000 hp. Heat transmission losses through this extensive underground system are held to a remarkable minimum by an exceptionally thick concrete-vermiculite envelope, which completely insulates the feed and return water pipes.

This system incorporates in its design automatic coal and ash handling equipment.

Building Contracts, Construction Up 1st Quarter

. . . in line with economy

BOTH building contract awards and actual construction put in place during the first quarter of 1955 topped the same period of last year.

Building and engineering contracts in the 37 eastern states, which rolled up the highest March dollar totals in history, totalled $5,220,412,000 for the quarter, 34 percent ahead of the like period for 1954 — the previous high — according to the F. W. Dodge Corp.

The March contract total — $2,134,819,000 — was 40 percent ahead of March 1954; 35 percent ahead of February, itself an all time high for that month; and was topped by only May 1951, whose total was swelled by contracts for atomic energy plants.

"When you consider that records were broken month after month through the winter, plus March, it becomes virtually certain that construction will continue at a high rate well into or through the summer," said Thomas S. Holden, Dodge vice chairman.

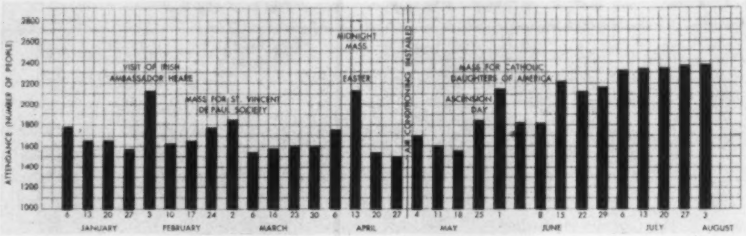
Current contract records, while spectacular, are not out of line with the needs of our fast growing economy, he said. The breakdown for March: nonresidential, $758,870,000, up 42 percent over February and up 43 percent over March 1954; residential, $989,730,000, up 33 percent over February and 48 percent above March 1954; heavy engineering, $386,219,000, up 28 percent over February and 18 percent above March 1954.

As for construction put in place, the first quarter total of the nation, reports the U. S. Departments of Commerce and Labor, was $8.4 billion, 13 percent above last year. Actual construction in March totalled $2.9 billion, a new high.

On a seasonally adjusted basis, new construction activity in this year's first quarter reached the unprecedented annual rate of $41 billion, as compared with an annual rate of $38 billion in the preceding quarter and actual expenditures of $37.2 billion for 1954.

Setting new first quarter records for work put in place were private residential, commercial, religious, and educational building. Industrial building increased 6 percent in the first quarter above the same period in 1954. Public school building was up 16 percent above the 1954 first quarter.

At the recent 36th annual convention of The Associated General Contractors of America, Inc., Welton A. Snow, manager of the Building Contractors Div., said, "Construction will be propelled to new heights this year by the increasing pressure of civilian needs." He said residential construction will approach $15 billion; commercial expansion may rise one-sixth to $2.5 billion; industrial building will decline mildly to $2 billion; institutional construction will continue at record breaking pace; and schools will call for $2.5 billion for new classrooms.



CONSISTENT HIGH ATTENDANCE was recorded at St. Patrick's Roman Catholic Church, New Orleans, in summer after air conditioning was installed, actually 44 percent above previous high average

Air Conditioning Increases Church Attendance

. . . and collections

INCREASED attendance and collections are among the results reported by churches in which year 'round air conditioning has been installed, according to Carrier Corp. In some instances, collections increased to a greater percentage than did attendance.

In St. Patrick's Roman Catholic Church, New Orleans, the system was installed after the best attendance months of the church year had passed. Figures recorded by the church staff revealed that attendance during the summer — when attendance is normally lowest — actually increased 44 percent over the best average attendance rate previously attained.

Other benefits, churches report, include reduction of outside noises and maintenance costs. Systems range from packaged units requiring no ductwork to large central systems in churches of varied architecture, construction and size.

Piping Identification Scheme Is Being Revised

. . . A13-1928 to be simplified

ACCORDING to the American Standards Association, the A13 sectional committee is working on a revision of this standard, which was reaffirmed in 1947, but no date has been scheduled for its completion. Unofficially, the committee indicates that no radical change in the significance of the colors is being considered. But the committee has discovered that there are too many fluids in pipes for proper designation by the limited number of colors which are easily recognized. Therefore, the committee is leaning toward the conclusion that identification of the substance in the pipe should be by means of either the chemical or trade name, leaving the color to designate whether the fluid is safe, dangerous, or for fire protection.

Boiling Water Reactor Development Pushed

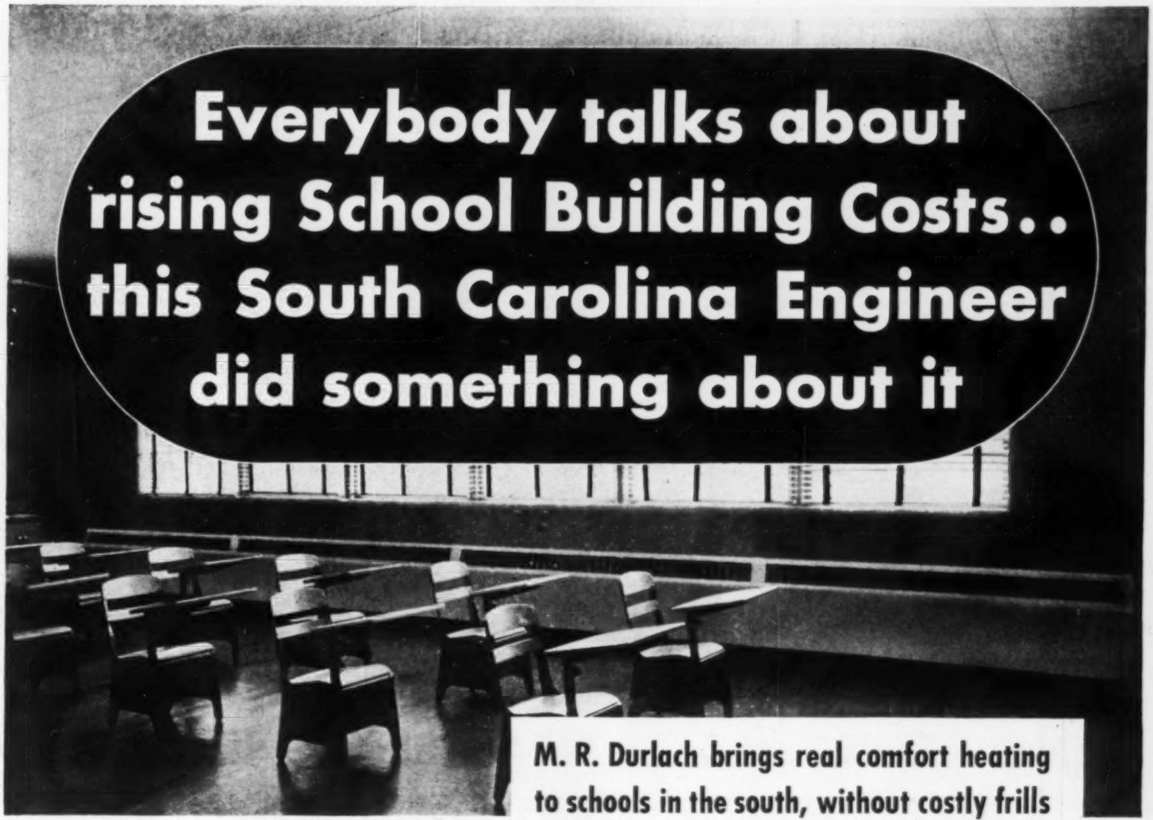
. . . to solve cooling problem

COOLING WATER in pressurized water reactors — the type being installed in the atomic power plant being built at Shippingport, Pa., — has to be under pressure of about 2000 psi to keep it from vaporizing. The temperature of the coolant is thus limited to about 600 F. The Argonne National Laboratory is trying to eliminate this limitation by boiling water in the reactor core as in a conventional boiler. Tests of nuclear stability are encouraging, according to Charles G. Manly, acting chief, Industrial Liaison Branch of the Reactor Development Div., Atomic Energy Commission.

Facilities for an experimental boiling water reactor to produce 5000 kw are scheduled for completion at Argonne in 1956. The architect-engineer is Sargent & Lundy Co., and Allis-Chalmers Manufacturing Co. is designing and fabricating the heat transfer equipment.

"Quote"

"The tallest tales of our times are told in technical terms."—*Louis S. Putnam, Dow Corning Corp.*



Everybody talks about rising School Building Costs.. this South Carolina Engineer did something about it

Classroom in Edwards Elementary School, Chesterfield, S. C. Total sq. ft. 39,125. Cost (not including land, financial and legal) $282,921. Heating cost $23,179. Architect: James & DuRant, Sumter, S. C. Consulting Engineer: M. R. Durlach, Jr., Columbia, S. C. Heating Contractor: M. W. Turnage, Chesterfield, S. C.

M. R. Durlach brings real comfort heating to schools in the south, without costly frills

M. R. Durlach, Jr., Columbia, S. C. has used Tru-Perimeter Heating in more than 30 new South Carolina schools since 1952... stayed within modest budgets . . . provided maximum heating comfort.

Webster Walvector, mounted along exposed walls, warms air in the room; warms floors and inside surface of outside walls; provides heating comfort everywhere – clean, gentle, even warmth . . . draft-free comfort with window ventilation . . . little temperature difference from floor to ceiling . . . Minimum piping, fewer risers, no hung ceilings or furred columns to conceal piping. And simplicity of design assures future low maintenance cost.

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SOME SCHOOL HEATING INSTALLATIONS ENGINEERED BY M. R. DURLACH USING WEBSTER WALVECTOR FOR TRU-PERIMETER HEATING

	Architect
Scott's Branch School Summerton, S. C.	James & DuRant
Robert Smalls High School Beaufort, S. C.	Heyward S. Singley
Newberry County High School Newberry, S. C.	Irvine B. Leslie
Wheeler Hill School Columbia, S. C.	James B. Urquhart & Alex A. Dickson
North Augusta Senior High School North Augusta, S. C.	Scroggs & Ewing
Macedonia School Blackville, S. C.	Lafaye, Fair, Lafaye & Assocs.
Hopkins High School Hopkins, S. C.	William Stork, Jr.
Bowman Elementary School Bowman, S. C.	J. W. Inabinet, Jr.
Pelion Elementary & High School Pelion, S. C.	Jesse W. Wessinger
Marshall Primary School Belton, S. C.	Ledbetter & Earle
Manning Training School Manning, S. C.	James & DuRant
Chesterfield Elementary School Chesterfield, S. C.	James & DuRant

G.E. HAS THE ANSWER TO AIR CONDITIONING PROBLEMS IN ANY STORE, OFFICE, OR FACTORY

Acoustical hung ceiling holds supply ducts and registers for distributing air cooled by G-E packaged units. Furred space itself acts as plenum for return air, entirely eliminating need for second set of ducts.

HUNG CEILING MAKES NEAT AIR CONDITIONING INSTALLATION, SAVES ON DUCTWORK

Fred Safran, well-known New York architect, was faced with the problem of remodelling three floors of a 33-year-old Brooklyn building into an attractive, air-conditioned sales and service center for a large business machine company.

After taking into account the building construction, the heat produced by operating business machines, varying occupancy loads, lighting and ventilating needs, a 15-ton General Electric Packaged Air Conditioner was installed on the first floor, and 10-ton units on each of the two floors above. Conditioned air is distributed through ducts concealed in the hung ceiling, and ceiling diffusers with dampers give precise local zone control. The G-E units take up a minimum of floor space and are completely enclosed, resulting in a neat, built-in installation at a moderate cost.

On the air conditioning phase of this assignment, Mr. Safran worked closely with the Billen Engineering Company, a G-E Air Conditioning Contractor in New York City, to meet the new tenant's specific requirements.

HERE'S WHY IT PAYS TO SPECIFY G-E PACKAGED AIR CONDITIONERS

- *Low installation, low operating costs.*
- *Gives the architect maximum design freedom. Units can be used in space or concealed, with or without ducts.*
- *Streamlined cabinet styling. Adds to decor of any interior.*
- *3, 5, 7½, 10, and 15 ton units can be used singly or in multiple to meet air conditioning needs of any building.*
- *Easily directed air flow for no-draft, no-waste air circulation.*
- *Muggy Weather Control removes excess moisture in any weather without over-chilling or clammy cooling.*
- *Built and factory assembled by General Electric. 5-year warranty covers entire sealed cooling system.*

Write for architectural data. General Electric Company, Commercial & Industrial Air Conditioning Department, 5 Lawrence St., Bloomfield, New Jersey.

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AIR CONDITIONERS

Progress Is Our Most Important Product

GENERAL ELECTRIC

"OPEN FOR DISCUSSION"

• *WE FOLLOW HERE each month the practice at engineering society meetings of providing an "open for discussion" period. You are urged to take part. Just address your comments to the Editors. Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2.*

Systematic Maintenance Is Investment, Not Expense, in Cutting Operating Costs

As C. T. Baker relates in his article, *Operating Costs Can Be Cut*, in the April HPAC, it is often proved that what is regarded as an item of expense could have been an investment. Too frequently, the cost of systematic maintenance is viewed as an expense item. The result of such a view is that equipment may be allowed to operate at reduced capacity and efficiency. Operation at the lowered capacity frequently continues until the capacity has reduced to an extent that demands attention.

Curtailing the outlay for small auxiliary steam equipment items, such as traps, often leads to losses that are not readily apparent. Inadequate drainage of condensate may increase processing time or impair quality. Increased process time means loss of output from the relatively higher price equipment the trap drains. Even though there are instances where a single trap seems to be performing satisfactorily, the cases where such installations have been found to be unsatisfactory are sufficiently numerous to indicate that such an attempt at economy is likely to prove disappointing.

Where steam is the heating medium, the conditions which govern heat transfer indicate the desirability of draining each piece of steam equipment by an individual trap. The many instances where faulty operation has been corrected by changing an installation from single trap drainage of a battery of equipment to individually trapping each piece of equipment confirm the importance of using an individual trap for each. If the net cost could be determined, it would likely be found that many times the price of the additional traps has been expended in increased process time — lost production — or poor quality work.

D. N. Crosthwait
Technical Adviser
C. A. Dunham Co.

New and Existing Multi-Story Buildings Are Different Air Conditioning Problems

The article, *Here's an Overall Look at Air Conditioning Multi-Story Buildings*, by P. B. Gordon, in the April HPAC, is excellent and contains a great deal of helpful information. However, there are two general comments we would like to make: (1) We believe it is difficult to combine the problems of new multi-story buildings and existing multi-story buildings in the same article, since the major problems and considerations are quite different. (2) We believe considerably more emphasis should be placed on the advances in recent years in centrifugal compressors.

With regard to new versus existing multi-story buildings, the primary considerations are certainly different in many ways. Although many matters must be decided in connection with any air conditioning system, an entirely separate list of problems becomes highly important in connection with an existing building.

Equipment space, noise and vibration, disturbance to building occupants, adequacy of the existing heating system, floor-by-floor installation, low load economy, and space for ducts and piping are just a few of those considerations to which I refer. Frequently, these considerations drastically affect the type of refrigeration equipment and distribution systems which can be used.

This also leads up to the new emphasis on modern centrifugal compressor design improvements. Mr. Gordon makes virtually no reference to the tremendous improvements in centrifugal compressors in his section on improvements in refrigeration compressors.

In existing buildings, one of the major problems until recently was that of finding space for refrigeration machinery, since basements are generally well filled with equipment. Although it was always agreed that there were definite advantages to locating the compressor and cooling tower near each other on the roof or intermediate floors, these advantages frequently seemed to be overshadowed by the problem of weight and noise and vibration.

Most centrifugal compressors used to require heavy concrete bases which, in addition to the weight of the equipment, required building reinforcements. Also, considerable loss in rentable floor space might result from disturbance to tenants as a result of noise and vibration in the vicinity of the equipment area.

The further problem of incorporating air conditioning without upsetting every office from top to bottom at the same time was a serious one. Then, too.

if air conditioning were to be incorporated one floor at a time over a period of time, it was impossible to provide cooling economically at very low partial loads when only parts of the building were air conditioned or occupied.

These major problems have either been eliminated or have been made very minor as a result of modern hermetic centrifugal compressors, which can easily be installed on intermediate floors and roofs without special bases or without nearly the basic equipment weight previously encountered. Some of these machines are now so quiet and vibration free that you can stand beside them and converse in perfectly normal tones. In fact, a coin can be balanced on edge on top of a compressor while it is operated over the full capacity range. These machines also provide automatic capacity control down to very low limits and, at the same time, adjust their use of power automatically in almost direct ratio to the cooling load. Obviously, this makes it economical to air condition a building by stages, installing enough refrigeration equipment at the outset to handle the completed job and yet operate economically under these extremely low load conditions.

Also, we believe a little more should be said about the use of the fan coil units around the perimeter of the building and primary air units for various zones. Perhaps it should be stated that primary air may be supplied from equipment rooms located on or near each floor. These equipment rooms, in turn, operate with chilled water and steam or hot water from a central source. Interior loads may be handled completely by this equipment.

We would point out also that in the perimeter area the terminal units are frequently provided with multi-speed fan motors to give tenants selective control of temperature.

M. L. Hoglund
Manager of Refrigeration Sales Dept.
The Trane Co.

For HTHW Connections, Study Water Circulation Inside Boiler First

I enjoyed reading Harry Hallwood's comments in the January HPAC regarding my articles on high temperature hot water heating, published in the January and February 1954 HPAC's. And I believe that many engineers profited from his published experiences.

However, since Mr. Hallwood's comments brought up some details not mentioned in my articles, I should like to add the following.

(1) I agree that shortcutting across the top layer of water in the boiler should be prevented. One way is to connect the return at the bottom of the boiler, as suggested by Mr. Hallwood. This is usually done on forced circulation water tube boilers.

Shortcutting also can be prevented when — for some reason or other — flow and return connections are made to the top of the boilers. The flow and return connections are placed as far apart as practicable. In some cases the return insert pipe is longer and its discharge opening is directed toward one side, as indicated in my article in the February 1954 HPAC.

In horizontal flue boilers of some European HTHW installations, the return insert pipe is sometimes curved and reaches close to the bottom of boilers.

An interesting solution has been made in the HTHW boiler of the Personal Products Co., Milltown, N. J. Here, in one of the oldest HTHW plants in the

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ASTM Readies 1955

Many new and revised tentatives and standards to be incorporated in the 1955 edition of the triennial book of standards of the American Society for Testing Materials will be recommended for adoption at the annual meeting in June. They were put into final shape by 32 ASTM technical committees which met recently.

Tubular Products

Among the revised standards are several for tubular products, sheet and strip, and bolting, as developed by ASTM Committee A-1 on steel. The carbon content of boiler or superheater tubes ordered to Specification A 210 will be reduced from 0.35 percent to 0.27 percent maximum. A standard practice for pipe lengths of austenitic steel covered by Specification A 312 has been established and will be incorporated in the specifications in place of the present Section 18. A new 70,000 psi tensile strength steel will be added to Specification A 106 for seamless carbon steel for high temperature service. Specification A 358 covering electric fusion welded austenitic pipe for high temperature service will have types 309 and 310 stainless steels added.

There will be a slight change in the chemical requirements for those alloy steels containing a nominal molybdenum content of $\frac{1}{2}$ percent. Likewise, the tables of chemical requirements in all the tubular product specifications have been in a state of flux during the past several years. It appears that a final suitable form has been agreed upon.

Carbon Steel Sheets

Specifications A 245 and A 246 covering structural quality carbon

U.S., flow and return are connected to the center of the boiler drum — natural circulation water tube boiler — and vertical baffles divide the drum, thus separating the return water from the flow. (See the article by Lewis Smith and Steven Senko in the July 1954 HPAC.)

The engineer should study the circulation of water inside the boiler first, and then make the flow and return connections so that they are adjusted to that circulation. The flow should be installed to the hottest, and the return to the coldest, sections of the boiler.

(2) The "lowest permissible water level" is exactly determined in the ASME Power Boiler Code (Par. P-291 and A-21). In most — not every — types of boilers, it is established 1 in. above the highest heating surface having water on one side and flue gases on the other.

According to the Code, "the lowest visible part of water gage glass shall be at least 2 in. above the lowest permissible water level." Therefore, in my opinion, the lowest permissible water level cannot be indicated in many cases on the gage glass in front of the boiler, as suggested by Mr. Hallwood. In my experience, the indication of "normal water level" is customary instead of the "lowest permissible water level."

In modern plants, automatic water level controllers take care of maintaining the normal water level instead of the operators.

(3) I agree with Mr. Hallwood's comment that there is no need for deaeration equipment in HTHW systems, and that water treatment is not an absolute necessity for every system. I have previously stated this in my February 1954 article. However, I have qualified this general rule, pointing out that "when steam is drawn from the boiler drum and thus more make-up is needed, water softeners and deaerators should be used."

I stress that steam should not be taken from HTHW boilers at all. If steam is needed, a heat exchanger should be installed which uses HTHW on the primary side.

My experience, however, is that many plant engineers or owners have the tendency to save the cost of a heat exchanger and take steam from the drum of the HTHW boiler directly. In some cases, all the condensate is lost, in other cases only part. The losses must be made up by feedwater. Now, if untreated water is added to the boiler continuously, the system's water will be corrosive and scaly. Experience has proved that in some of the earlier systems, where steam was taken freely from the boiler drums and no attention given to feedwater treatment, deposits and incrustations caused stoppages in the heating elements and seizures in the valve seats.

(4) Figs. 1 and 2 accompanying Mr. Hallwood's comments are especially valuable for those engineers who are facing the problem of using an existing steam boiler for both steam and HTHW service. The "producer" — shown in the figures — is better known under the name of "direct contact heater." Another type of HTHW producer is called "cascade heater."

Most HTHW heating systems in Europe started with the use of such "direct contact" or "cascade" heaters. In these heaters, high pressure steam is used for heating the water of the HTHW system, either by injecting steam into the water, or by spraying the return water into the steam space. The steam, being clear, does not carry over impurities in the HTHW system. The surplus water, resulting from the condensation, will be carried back to the boiler.

Book of Standards

. . . some important changes noted

steel sheets will very probably be combined. Also commercial quality sheets will be covered by another specification with strip included, if feasible. These developments are necessitated by the changing methods of manufacture.

Bolting Requirements

The low temperature bolting Specification A 320 will cover grades 4340 and 8640. In the four bolting Specifications A 193, A 194, A 261, and A 320, it is proposed to change the requirements for minimum clearance for the screw threads. This action is necessary since the American Standard Bl.4-1945 presently referenced will become obsolete.

Copper Tube and Alloy Pipe

A new specification for type B copper tube and another for copper-silicon alloy pipe and tube are under study by Committee B-5.

New Industrial Water Manual

Significant progress on plans for a second edition of the Manual on Industrial Water is reported by Committee D-19. Action was taken to recommend for adoption as standard the Methods for Examination of Water-Formed Deposits by Chemical Microscopy (D 1245); for Iodide and Bromide Ions in Industrial Water (D 1246); and for Reporting Results of Analysis of Industrial Water (D 596). The committee recommended publication, for information only, of a comprehensive set of tests for optical properties of industrial water, covering all important current instrumentation and techniques in this field.

In connection with Fig. 1 of Mr. Hallwood's January comments, I think attention could be called to the fact that "filling point" is not the continuous feedwater connection but merely a connection to a water hose to fill the HTHW system for the first time, or after a draining, if such would be necessary. The feedwater connection, which is not shown in the diagram, should be made to the boiler directly, of course.

S. A. Kuli
Engineer
ADSCO Industries, Inc.

Requests Fair Break for Low Velocity-Low Pressure Air Distribution Systems

Let's give low velocity-low pressure air distribution systems a "fair break." There have been a lot of articles written on the advantages of high velocity and/or pressure systems. It seems to me that a lot of these advantages claimed apply also to low velocity and low pressure systems.

1) *Lower First Cost of Ductwork Due to Lower Supply Air Temperature*

There seems to be an erroneous reasoning that only high velocity and/or pressure systems may use a lower supply air temperature and therefore reduce the ductwork. Most of the "high velocity outlets" I have seen are composed of a "high velocity/pressure damper" with a sound box and an ordinary low velocity outlet. (However, certain under window units do take advantage of induced secondary air to lower the resultant discharge air temperature.) I see no reason why there should be any difference in the lowest supply air temperature of either the high or low velocity systems, with the present high velocity sidewall grilles and ceiling outlets.

There are several reasons to limit this supply air temperature to not lower than 25 F below room temperature. One reason is that in the Kansas City area all of the supply ducts would have to be insulated to prevent moisture condensation. Another good reason is the increase in compressor horsepower to obtain this lower air temperature. Still another good reason is the reduced amount of cooling obtainable when operating on outside air, a very important feature in the Kansas City area, where one day the temperature may be in the 80's, and the next day, below freezing.

2) *Lower First Cost of Ductwork Due to Smaller Ducts Obtained by High Velocity*

There are several factors that are overlooked when estimating this saving.

In using round ducts, to increase the velocity four times the circumference of the duct is only reduced to one-half.

Heavier gages and more airtight ductwork is required.

Sound absorbing plenums at supply outlets may require as much or more material and labor as low velocity branches would.

The increase in fan horsepower due to higher static pressure increases the operating cost considerably.

3) *Savings In Overall Building Height Due to Reduction of Space Required Above Suspended Ceilings*

The sound absorbing plenums for the "high velocity outlets" as supplied by most grille manufacturers require as much space above the ceiling as the *branch* ducts would require in a low velocity system. By coordinating the ductwork and structural plans, the main supply ducts may be run perpendicular to the shallow beams or joists and the branch ducts perpendicular to the deep beams.

Let's assume that there is some saving in the overall building height, but let's be fair in our estimate of what this saves or gains. I've recently read an article saying that this reduction in building height was the equivalent of one additional story on the building referred to in the article. A lot of people reading this article will assume that one additional floor of usable space may be had at no additional cost, forgetting the additional cost of the floor construction, ceiling construction, electrical system, heating, plumbing, air conditioning systems, etc. I think this saving is extremely exaggerated. I also think this additional space above the suspended ceiling may prove to be quite valuable in the future, especially in these "flexible?" office buildings.

There are definitely some advantages to the high velocity and/or pressure systems, and these will increase in the future as new ideas and techniques are developed. I am very thankful to those who have and are pioneering — some will say they are no longer pioneering — in this field because we cannot progress without new ideas and methods.

I can't help but feel, though, that with a lot of high velocity and/or pressure systems, the advantages are being over-exaggerated and the disadvantages overlooked.

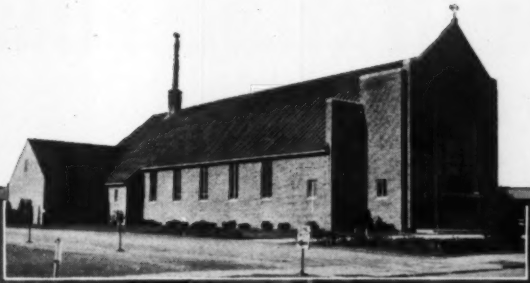
Gilbert F. Hellmer
Mechanical Engineer

1500 Fpm Minimum Velocity Required in Refrigerant Risers at Maximum Load

In the article, *Better Refrigerant Piping for Parallel Compressor Systems*, by Lincoln R. Scafe, in the March HPAC, there is a technical error which should be corrected. On page 125 under the subhead, "With Capacity Modulation," the sentence at the end of the first paragraph, which reads, "The larger one is sized so that the velocity through both risers will not be less than 1400 fpm at maximum load," should read, "will not be less than 1500 fpm at maximum load," as stated elsewhere on the page.

The value 1500 fpm is considered the ideal velocity under such circumstances, and anything below this will result in not returning oil to the compressor and will trap it in the crankcase.

J. M. Lamke
The Trane Co.

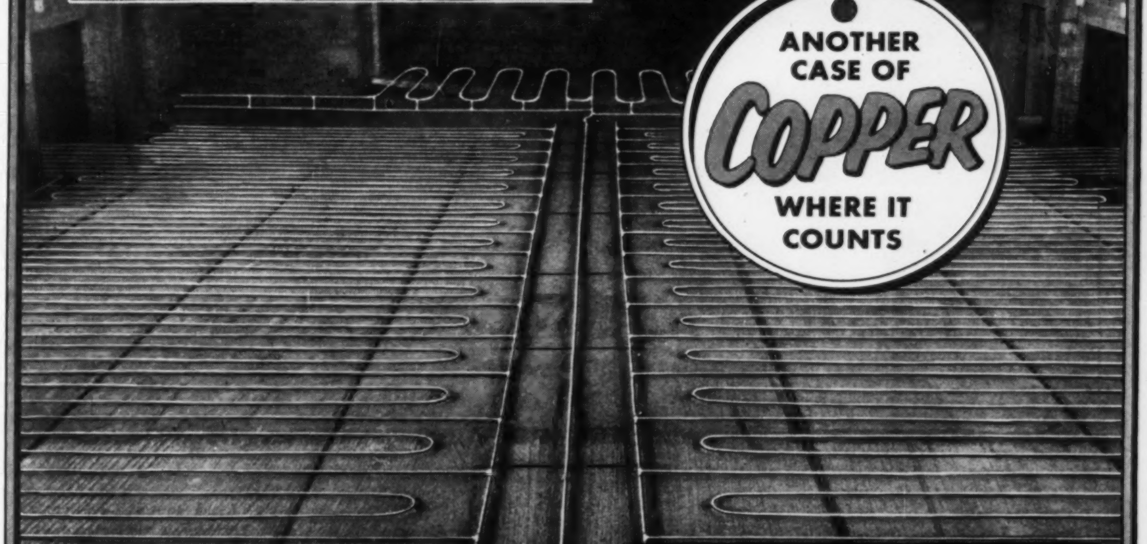


St. John The Baptist Church

Rome, N. Y.

Architect: FRANK W. BRODRICK, Syracuse, N. Y.
Engineer: MALCOLM B. MOYER, Syracuse, N. Y.
Gen. Cont.: JAMES PAOLINI CONST. CO., INC., Syracuse, N.Y.
Heat Cont.: O'SHEA SUPPLY CO., INC., Rome, N. Y.

ANOTHER CASE OF COPPER WHERE IT COUNTS



The beauty of heating a church by radiant panels is that traditional as well as modern architectural design may be used without having to make allowances for outlets or radiators in your design. It is the number one method of heating churches and similar permanent structures. And, when installation is completed panels are invisible. Also, when Revere Copper Water Tube is used it is easily and readily installed, easy to bend, requires no thread cutting and the solder or compression fittings used are readily made. There are fewer of these fittings and they are tight, trouble-free fittings when finished.

A radiant panel heating system of Revere Copper Tube is a long-lasting one, too, which is mighty important in a permanent structure such as a church. For copper tube cannot rust, its endurance has been proved for centuries.

So never mind what the other fellow says . . . *you* keep out of trouble with copper. Use Revere Copper Water Tube for radiant panel heating, hot and cold water lines, underground service lines, processing lines, waste stack and vent lines. Your Revere Distributor has plenty of stock these days, in all the required sizes.

IN THE LARGE PHOTO ABOVE NOTE THE NEAT LAYOUT, the even, easily-bent lengths of Revere Copper Water Tube, the few number of fittings . . . only every 60' in the panels. 5,000 ft. of tube was used in sizes ranging from ¾" to 1½". The architect and contractor tell us that the suggestions made by one of Revere's Technical Advisors were most helpful in both the planning and installation stages. Why don't you take advantage of this service? No obligation, naturally.

REVERE

COPPER AND BRASS INCORPORATED

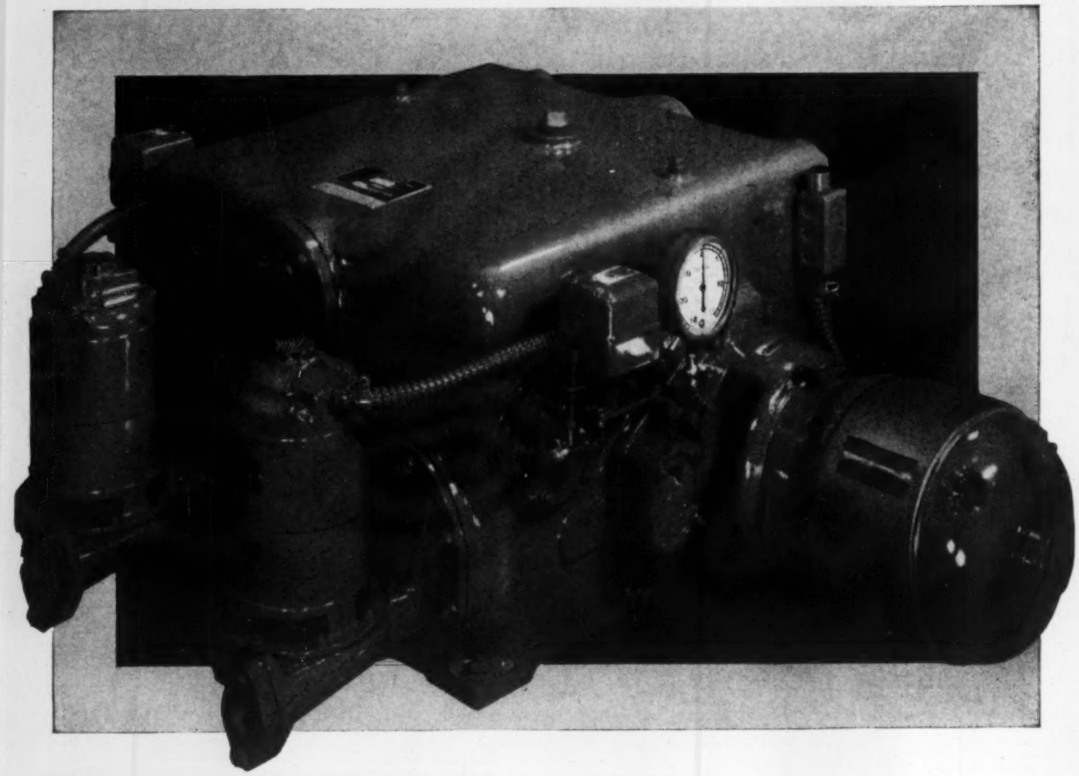
Founded by Paul Revere in 1801

230 Park Avenue, New York 17, N. Y.

• • •

Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N.Y.—Sales Offices in Principal Cities, Distributors Everywhere.

THIS NEW VACUUM HEATING PUMP IS SIZED TO ACTUAL JOB REQUIREMENTS



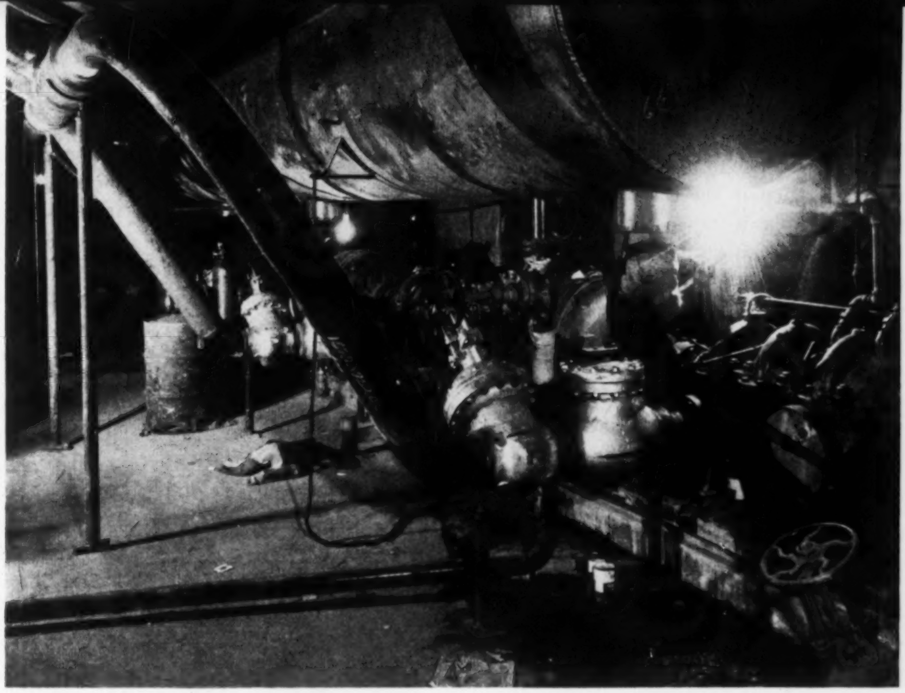
It's the Nash CSM

No longer is it necessary for the Engineer to accept a vacuum heating pump with air and water capacities based inflexibly upon square feet of equivalent direct radiation. With the flexible Nash CSM he can provide for proper air capacity in accordance with his judgment and experience. For the individual capacities of the separate pumps on the CSM may be varied within a wide range, without buying an oversize receiver and oversize water pumps.

These pumps possess many other features which permit a more efficient utilization of fuel and minimum use of electric power. Low, low, returns reduce installation costs and usually eliminate putting the pump in a pit. Simplicity and efficient operation reduce supervision and maintenance costs. Information regarding this new heating pump development is available immediately upon request.

- ✓ **Increased air capacity induces rapid system response without wasteful overheating.**
- ✓ **Separate air and water pumps individually selected to meet actual job requirements.**
- ✓ **Control system that operates individual pumps only when needed.**
- ✓ **Flexibility permitting addition of radiation without changing basic pump installation.**
- ✓ **Low, low, return line connection.**

NASH ENGINEERING COMPANY
438 WILSON, SO. NORWALK, CONN.



THE SCHEDULE NUMBER SYSTEM designating a series of pipe wall thicknesses has undergone two changes in formula since its inception 20 years ago. The latest change is of particular significance at the higher pressures and temperatures now in use where pipe wall thicknesses became excessive under the old rules

How New Pipe Wall Thickness Formula Affects P/S Ratios

By Sabin Crocker
Mechanical Engineer
Ebasco Services, Inc.

With the latest change in the formula for determining pipe wall thickness, significant changes in the basic pressure/stress ratio are in effect. For example, influences of the present *P/S* ratio are different below 900 F from those above 900 F. Also, certain *P/S* relations permit wall thicknesses slightly less than those previously required, while others permit a higher working pressure for a given material and temperature. And these effects differ for various schedule numbers and according to pipe size.

Here is a review of the changes in the pressure/stress ratio, with necessary information for choosing pipe schedules under the new formula.

A NEW FORMULA for determining pipe wall thickness was adopted in 1952 for the American Society of Mechanical Engineers Power Boiler Code and for certain sections[1] of the American Standards Association Code for Pressure Piping. This formula differs from the formula used for some years before in that it contains a parameter *y*, which serves two purposes: (a) to distinguish between operation in the elastic range and in the plastic range for either ferritic or austenitic steels; and (b) to have little effect with thin walled pipe and progressively greater influence as the wall thickness increases.

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[1] Power Piping and District Heating Sections, and as an alternative in the Oil Piping Section. The Refrigeration, and Industrial Gas and Air Sections still use the 1947-1951 version, probably because they are not concerned with temperatures above 900 F.

Mr. Crocker is Vice Chairman of the American Standards Association's Sectional Committee B31 on the Code for Pressure Piping. He is also a member of HPAC's board of consulting and contributing editors.

The reasons for the change in formula and the advantages of the new formula are fully discussed by W. R. Burrows, R. Michel, and A. W. Rankin in *A Wall Thickness Formula for High-Pressure High-Temperature Piping*, an ASME paper published in the April 1954 Transactions. However, the purpose of the present article is not to review that history in detail here, but to discuss changes in the basic pressure/stress ratio, commonly called the *P/S* ratio, which resulted from the change in formula.

In a previous article, *How To Use Schedule Numbers in Power Piping Design*, in the May 1951 HPAC, this author traced the origin of the "Schedule Number System" for designating a rational series of pipe wall thicknesses and identified the schedule numbers as being 1000 × *P/S* ratios for certain conventional assumptions made by ASA Sectional Committee B36 when it set up the system, using the pipe wall thickness formula then current.

Since the inception of the schedule number system, there already have been two changes in the formula. Conditions as they existed after the first change were presented in the May 1951 HPAC article. The effect of the second change is discussed here.

New, Old Formulas Compared

The original Code formula adapted by ASA Sectional Committee B36 for use in setting up the schedule number system was the following version of the Barlow formula:

$$t_{min} = (PD/2S) + C \ldots\ldots [1]$$

For plain end seamless pipe over 1 in. diameter,

$$t_{min} = 0.875\, t \ldots\ldots [2]$$

and,

$$C = 0.65 \ldots\ldots [3]$$

from which

$$0.875\, t = (PD/2S) + 0.065 \ldots [4]$$

or

$$t = (PD/1.75S) + 0.1 \ldots\ldots [5]$$

$$0.065/0.875 = 0.1 \text{ approximately } . [6]$$

and

$$P/S = [1.75\,(t - 0.1)]/D \ldots [7]$$

where t = nominal pipe wall thickness, in.; t_{min} = minimum pipe wall thickness on inspection, in.; P = maximum internal service pressure, psig; D = outside diameter of pipe, in.; S = allowable stress due to internal pressure (S value) for the material and operating temperature, psig.

Modified Formula 1947-1951

The Code formula used in the 1947 to 1951 era — the modified Lame′ — was expressed as:

$$t_{min} = PD/(2S + 0.8P) + C \;.[8]$$

from which

$$0.875\, t = PD/(2S + 0.8P) + 0.065 \ldots\ldots [9]$$

Transposing and solving for *P/S*

$$P/S = (1.75t - 0.130)/(D - 0.7t + 0.052) \ldots [10]$$

Values of 1000 *P/S* for all schedule numbers and pipe sizes computed by this formula were presented in the chart included in the May 1951 HPAC article.

Present Formula Has y

The Code formula used since 1952 — a modified Lame′ with *y* parameter — is

$$t_{min} = [PD/(2S + 2yP)] + C \ldots\ldots [11]$$

from which

$$0.0875\, t = [PD/(2S - 2yP)] + 0.065 \ldots\ldots [12]$$

Transposing and solving for *P/S*

$$P/S = (1.75t - 0.130)/[D - y(1.75\,t - 0.130)] \;.[13]$$

where *y* is a coefficient having values as given in Table 1 and the other terms are as previously defined.

Comparison of the foregoing formulas shows that the "present P/S ratio" is identical with the "1947-1951 ratio" when $y = 0.4$, which agrees with the intention of the committee responsible for developing the present formula. Hence, both formulas give the same wall thicknesses for temperatures up to 900 F. It is further evident that for temperatures above 900 F the present formula, through use of the *y* parameter, permits using wall thicknesses slightly less than those previously required. Likewise the *P/S* ratio is influenced by the increase in the *y* parameter above 900 F, the effect being to permit a somewhat higher working pressure for a given material and temperature.

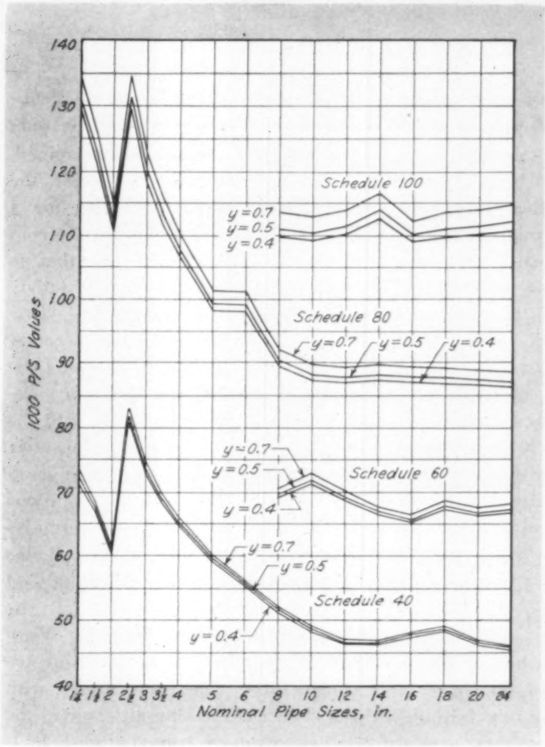
Another characteristic of the way the *y* parameter is applied is that it has little effect on the allowable working pressure or on the *P/S* ratio in the case of thin walled pipe, but it is progressively more important as the wall thickness increases. For instance, the effect of changing *y* from 0.4 to 0.7 is almost negligible for schedule 40 pipe, whereas for schedule 160 a corresponding change increases the allowable working pressure and the *P/S* ratio by something of the order of 5 to 10 percent, depending on pipe size.

Graphs Show Extent of Change

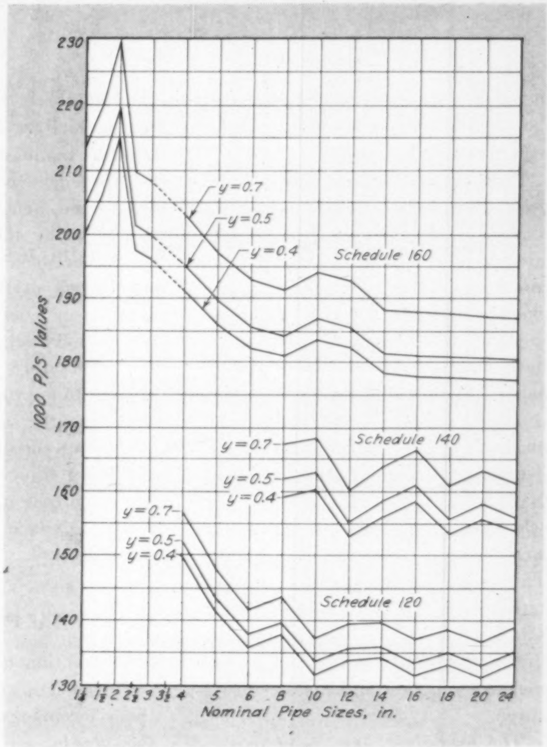
Values of 1000 *P/S* for schedule numbers from 40 to 160 inclusive and all pipe sizes above 1 in. as computed by the new formula are presented in the accompanying charts. Because of the use of three different values for the *y* parameter in the formula, it is now necessary to show three separate lines for each schedule number. Owing to the way the *y* parameter is applied in the formula, the lines are close together for thin wall pipe and progressively farther apart for heavy wall pipe. Graphs for schedules 10, 20 and 30 are not

TABLE 1—VALUES OF COEFFICIENT *y* for new formula for wall thickness

Temperature, F	900 and below	950	1000	1050	1100	1150 and above
Ferritic steels	0.4	0.5	0.7	0.7	0.7	0.7
Austenitic steels	0.4	0.4	0.4	0.4	0.5	0.7



GRAPHS FOR VARIOUS SCHEDULE NUMBERS not only visualize the significance of the *y* parameter in the new formula but can be used as a convenient means for selecting the proper pipe wall thickness for any given service conditions in power piping systems using plain end steel pipe.



Given the service pressure and temperature, the 1000 *P/S* ratio is found by dividing 1000 times the service pressure by the allowable stress for the service temperature as given in Code tables. For any particular pipe size, the next heavier schedule number than the computed value of 1000 *P/S* is selected.

The 1000 P/S values vs nominal pipe sizes for plain end steel pipe shown here are computed from the new pipe wall thicknesses formula in the ASME Power Boiler Code and the Power Piping and District Heating Piping Sections of the ASA Code for Pressure Piping.

Plotted values include the code allowances for "mechanical strength and/or corrosion," and a 12½ percent mill tolerance in pipe manufacture.

HOW TO USE CHARTS

Example 1: Simple case where one schedule suffices

Problem: What pipe schedule should be used for a steam system being designed for 600 psig steam superheated to 700 F? Assume that grade B carbon steel pipe will be used conforming to ASTM specification A106 and having an allowable stress of 14,350 psi at 700 F. The *y* parameter for a ferritic steel at 700 F is 0.4.

Solution: 1000 $P/S = (1000 \times 600)/14{,}350 = 41.8$

From the chart at left, it is evident that all sizes of schedule 40 pipe for $y = 0.4$ are a safe margin above the 1000 $P/S = 41.8$ ordinate of the chart. Hence, if the pipe is to be used with plain ends, Schedule 40 will be acceptable throughout.

Example 2: Complex case where more than one schedule is required

Problem: What pipe schedules should be used for a steam system being designed for 1300 psig and 1000 F? Assume that chromium-molybdenum alloy steel pipe having an allowable stress of 7800 psi at 1000 F will be used. The *y* parameter for a ferritic steel at 1000 F is 0.7.

Solution: 1000 $P/S = (1000 \times 1300)/7800 = 166.5$

From the chart at right, it appears that the 8, 10 and 16 in. sizes of schedule 140 pipe for $y = 0.7$ are at or above the 166.5 ordinate and, hence, are adequate for this service. Other sizes will have to be schedule 160.

included since the effect of changing the y parameter is almost negligible with these light weights.

These graphs offer a visual demonstration of the extent to which the formula has been changed to take advantage of the latest theories for computing stress in materials in the plastic range above 900 F. The bases for this forward step are discussed in the Burrows, Michel, and Rankin paper. As a result of more logical concepts regarding the behavior of materials in high temperature service over long periods of time, it is now permissible to use the heavier pipe schedules at higher P/S ratios than were allowed under the old formulas. This is due to a change in formula rather than to the upward revision of allowable stresses also adopted by the Codes in 1951 as on its own merits a separate and distinct proposition.

The formula change is of particular significance at the higher pressures and temperatures now in general use for large central station turbine generators, where pipe wall thicknesses became excessive under the old rules. For throttle steam conditions of 1800 psig and 1050 F, a wall thickness of something of the order of 3½ in. is required with a ferritic steel such as 2¼ percent chromium, 1 percent molybdenum in order to get a 12 in. pipe bore even with the revised formula. In other words, the pipe is 19 in. OD by 12 in. ID. Obviously, these conditions, which represent a 1000 P/S value above 300, are beyond the scope of schedule 160 pipe, as shown on the graph, which is the heaviest available thickness of "seamless pipe."

For thicknesses heavier than schedule 160 where "seamless pipe" is not commercially available, pipe is made by other manufacturing methods such as "forged, turned and bored," "hollow forged," etc. For these extremely heavy walls, the thermal gradients set up between the inside and outside layers of the pipe wall during heating or cooling of the line are increasingly significant, particularly if temperature changes are rapid enough to approach shock conditions. Consequently, any change in pressure/stress theory which tends toward justifying thinner pipe walls is doubly important in that by doing so it tends to reduce thermal gradients in the pipe wall.

Graphs Aid Pipe Selection

In addition to furnishing a means for visualizing the significance of the y parameter in the new formula, the graphs can be used as a convenient means for selecting the proper pipe wall thickness for any given service conditions in power piping systems using plain end steel pipe. Assuming the service pressure and temperature are known, the 1000 P/S ratio is readily determined by dividing 1000 times the service pressure by the allowable stress — S value — for the service temperature as given in Code tables. For any particular pipe size desired, the next heavier schedule number than the computed value of 1000 P/S is selected from the chart.

In some cases, the 1000 P/S value determined for the given conditions can be accommodated for all sizes of pipe by a single wall thickness schedule. As illustrated in the first example accompanying the charts, this fortunate situation can be identified at once from the chart as soon as the 1000 P/S value is determined.

In other attempts to select the proper pipe wall thicknesses for a given set of power piping service conditions, it sometimes develops that no single schedule number will satisfy Code requirements in all pipe sizes. Under these conditions, it becomes necessary to pick and choose from available schedules in order to make a series of selections that will be satisfactory for each of the respective sizes to be used. While this could be done through repeated solutions of the pipe wall thickness formulas given in the ASME Power Boiler Code and in the Power Piping and District Heating Sections of the American Standard Code for Pressure Piping, the process would involve considerable time and effort with the chance of making an error in the rather involved computations. It is simpler and more dependable, therefore, to read the answer from a chart, such as the one accompanying this article. In this way the problem can be visualized as a whole so that inconsistencies become apparent. Furthermore, the chance of making an error is reduced in proportion to the ease of solution.

The graphs on the accompanying charts were plotted from Equation 13 so that they can be used directly for determining allowable P/S ratios for plain end pipe of the thickness schedules shown without having to make further adjustments for manufacturing tolerance and C allowance. In other words, manufacturing tolerances and C allowances are already provided for in computing and plotting the graphs.

Finish Air Conditioning 53 Year Old Office Building

. . . project costing **$600,000**

Built in 1902 of sturdy fireproof construction and framed with structural steel, the 18 story First Federal savings and loan association building in Chicago's Loop will be completely air conditioned by June 1. The first six stories — mainly occupied by the association's offices — were air conditioned in 1948. Now the remaining 12 stories, with 100,000 sq ft of floor space occupied by 101 tenants, are being air conditioned, at a cost of more than $600,000, according to Morton Bodfish, president of the First Federal savings and loan association.

Each office will have individual temperature and humidity control.

A large brick penthouse is being constructed on the roof to house some of the air conditioning equipment.

Rotary Marks 50th Anniversary

. . . new air conditioned world headquarters building to be center of activities

THIS MONTH Rotary International celebrates its 50th anniversary in Chicago, home of its late founder, Paul P. Harris. One of the points of interest the representatives of the 8600 Rotary Clubs from 90 different countries will want to visit is the new world headquarters building in Evanston, Ill., a Chicago suburb.

Begun in 1905 as a meeting of four "small-town Americans lost in the big city of Chicago," the original club has grown in half a century to an international organization so vast that there is a meeting of a Rotary Club somewhere all around the world in every hour of the daily 24.

The Rotary headquarters office was for many years in Chicago on East Wacker drive.

Last year, Rotary's "World Secretariat" moved into a new air conditioned 50,000 sq ft limestone building. From this center, 160 employees supervise club affairs which, in addition to the publication of a magazine in two languages, involve sending out 1,000,000 pieces of mail annually and handling 300,000 that come in.

As in all modern buildings built today, a number of facilities are incorporated to promote efficiency, and air conditioning is one. The offices and conference rooms on the first and second floors are heated and cooled by circulating hot or chilled water through the same piping system. One air conditioning system serves the interior of the building, and the other serves the outside or perimeter of the building through perimeter units under the windows. Cooled or heated air is supplied to these units from one of the central station units equipped with heating and cooling coils, an air washer, and filters, in the penthouse. Approximately 14,000 cfm of air is circulated through this system against a static pressure of 7 in. WG; 100 percent outside air is circulated through this system at all times, except under maximum cooling load conditions.

The perimeter unit under each window is controlled automatically, individually within a range whose upper limit is determined by the room thermostat. Chilled water is circulated through the perimeter units in summer, and hot water in winter.

The interior areas are divided into five zones, and pneumatically controlled dampers regulate the temperature of air to each. The central station unit for the interior areas delivers 7100 cfm of outside and recirculated air against a static pressure of 2 in. WG and is also in the penthouse.

Three separate air handling units serve the basement areas. One delivers 3000 cfm to the mailing and storage rooms, and one delivers 2800 cfm to the basement lunch room. A third unit which delivers 2200 cfm serves the print shop and also controls the relative humidity.

Two oil-fired boilers produce steam at a pressure of 8 psig for heating. Each has a capacity of 3,000,000 Btu per hr and can carry the heating load independently until zero temperatures outside are reached. A steam to water heat exchanger is used as a converter for the forced hot water circulating system. The design heating load is 3,688,000 Btu per hr, and this consists of 694,250 Btu per hr in the air tempering coils, 1,196,350 Btu in the reheat coils, 307,200 Btu per hr for domestic hot water, 1,050,000 Btu per hr for the secondary heating system, 273,850 Btu per hr for the basement steam heating system, and 166,350 Btu per hr for steam heating in the corridors and lobbies. Pneumatic controls are used throughout the building.

A centrifugal compressor with a cooling capacity of 150 tons is in the boiler room in the basement, chilling 265 gpm of water to 42 F. Condensing water from the cooling tower on the roof delivers 450 gpm of water at 85 F. The same type of circulating pumps as used for hot water are used for circulating condenser water to the cooling tower.

The cost of the building was about $1,200,000, of which about $181,000 was spent for the boilers, convectors, piping, controls, the cooling and heating coils, and the filters. Approximately $68,000 was the cost of the ductwork, the fans, supply outlets, and the casings for the perimeter units.

The architects were Maher and McGrew, who retained Neiler, Rich & Bladen as consulting engineers for the design of the heating and air conditioning systems. The systems were installed by C. W. Johnson, Inc., heating and air conditioning contractor, and the fans, ductwork and supply outlets were installed by Hunter-Clark Ventilating System Co.

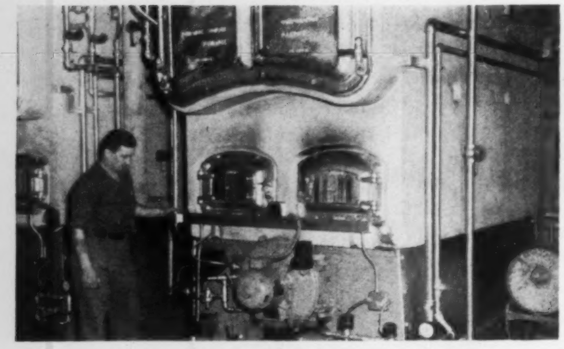
for special tour of new building turn page

. . . we take a guided tour of Rotary's air conditioned

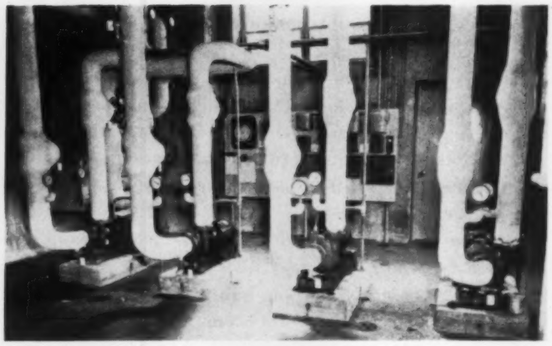
ROTARY INTERNATIONAL

1 WE ENTER Rotary's new \$1¼ million air conditioned "World Secretariat" in Evanston, Ill., headquarters for 8600 clubs throughout the world

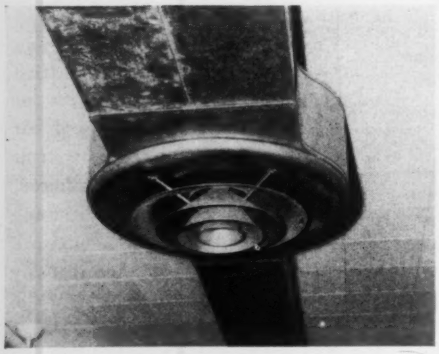
2 IN THE RECEPTION ROOM, colorfully displayed flags of many countries and geographical regions welcome us and furnish striking evidence of Rotary's internationality



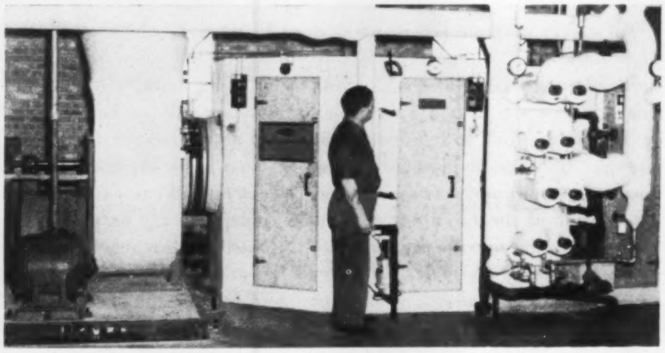
5 IN THE BASEMENT, Frank Rylander shows us the two oil fired boilers which produce all steam and hot water for the building. Each has a capacity of 3 million Btu per hr



6 WE ALSO TAKE A LOOK at the four circulating pumps in the mechanical equipment room, installed between the water chiller and the boilers, both out of view



9 IN THE PRINT SHOP, ceiling air diffusers distribute conditioned air from the air handling unit

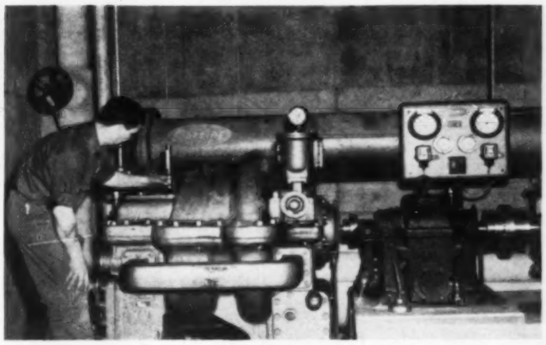


10 UP IN THE PENTHOUSE, this central station unit filters, heats and/or cools 100 percent outside air for the perimeter system

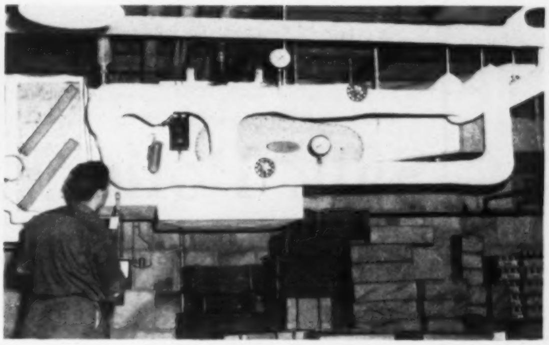
"world secretariat" building

3 OFFICE SPACES throughout the building are air conditioned for the 160 staff members who serve in the administrative and service functions centered here

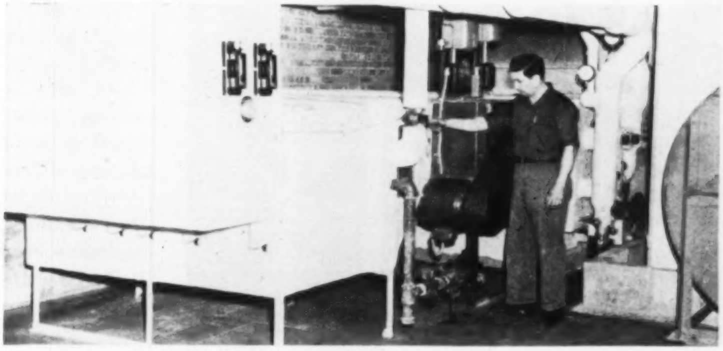
4 HERE WE SEE individually controlled units of the perimeter system which serves offices and conference rooms on the first and second floors



7 COMPLETING OUR TOUR of the mechanical equipment room, we inspect the 150 ton centrifugal compressor and water chiller. Cooling tower is installed on the roof



8 IN THE STORAGE ROOM, Mr. Rylander shows us the 3000 cfm air handling unit which serves this and the mailing room. Similar but smaller units serve the lunch room and print shop



11 ALSO IN THE PENTHOUSE is this central station unit for the interior system. Pneumatically controlled dampers regulate the air flow to each of the five zones

ENOUGH FOR ALL SOON

Predict Plentiful Supply of Vaccine

Call Polio VaccineTo Over Gold

Calls for Shots Flood Doctors

1st, 2d Grade Plans All Orderly, But Confusion Reigns for Rest

BY ARTHUR J. SNIDER
Daily News Science Writer

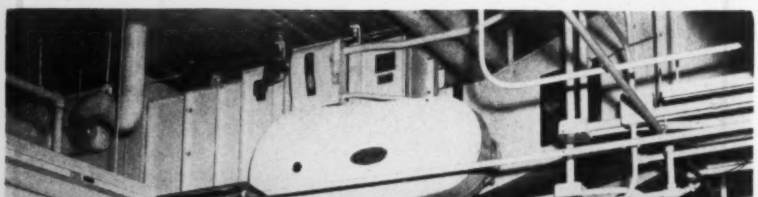
There was orderliness Thursday in the plans to inoculate Chicago's 140,000 first and second graders.

Vaccine 'Extremely Successful' Against Fatal Bulbar Type

Highly filtered air for sterile production areas and closely controlled temperatures for the incubator and storage rooms, as well as the air conditioned animal quarters and packaging building, are necessary for vaccine production as explained in this article especially written for HPAC last month as the success of the vaccine was announced in the press.

Air Conditioning Vital To Salk Polio Vaccine Process

By Hugh F. Johnson
Engineering Div.,
Eli Lilly and Co.



AIR CONDITIONING and heating both are necessary to maintain incubators for the growth of tissue and vaccine culture on shaker units at 96 F due to exterior west walls

AIR CONDITIONING is an absolute essential to the Eli Lilly and Co. plant, Indianapolis, for mass production of the Salk polio vaccine.

Special production requirements presented interesting problems.

The vaccine is commercially produced by tissue culture techniques, requiring absolute sterility in processing areas, controlled temperature during incubation of the vaccine, dependable refrigerated chillrooms for storage of the product, and sanitary quarters for housing and maintaining the laboratory animals. Sterility and sanitation are the basic requirements in every operation.

Filtration Aids Sterility

Sterile production areas are isolated from the surrounding plant for the many operations in the production of the vaccine. Air conditioning with highly filtered, temperature controlled air introduced through low velocity diffusers to minimize air movement is vitally necessary to protect these sterile areas from infiltration, as well as to counteract the internal heat gains from equipment and personnel. These areas are maintained at 78 F and 48 percent relative humidity. Both mechanical and electrostatic filtration insure the cleanliness and freedom from foreign matter of the air supplied.

Maintain Incubator at 96 F

The incubation necessary to promote the growth of tissue and vaccine culture is done in an air conditioned incubator maintained at 96 F, with a tolerance of ± 1 F. The media itself is in closed containers.

The room has three exterior walls — a west and north wall of glass block and a south wall of concrete — which contribute either heat or cold, depending upon the season, sunshine, and other factors. There is also a sizable internal heat load from the electrical equipment and lights. The net result is that both heating and cooling are required.

Temperature Must Be Uniform

Because all available floor space is needed for processing, the air supply is overhead, with return air being taken from several locations along the outside walls. Uniformity of temperature throughout the entire room is a strict requirement.

An electronic temperature recorder measures and records temperatures at various locations and elevations in the incubator. Each station is equipped with an electrical alarm system which operates a signal light and bell alarm if the temperature exceeds specific limits.

Pneumatic controls include a submaster fan discharge thermostat controlling the steam and chilled water valves on the fan-coil unit. The fan-coil unit maintains a 3 minute air change rate within the space. A minimum amount of outside air is used. Only the west glass block wall of the area is insulated. The conditions in the room are extremely uniform.

STERILE PRODUCTION area is air conditioned with highly filtered, temperature controlled air introduced through low velocity diffusers

Animals Get Special Conditions

Animal quarters, with adequate provisions for feeding, watering, and maintenance of cleanliness, are supplied with filtered, heated, 100 percent outside air, with thermal control to maintain 80 F when outside conditions permit. All the air supplied is exhausted through exhaust systems to prevent build-up of animal odors.

Animals used for test purposes are housed in air conditioned quarters to assure uniform control. This air conditioning consists of a fan-coil unit supplied with steam and chilled water. To maintain uniform conditions, this system uses 50 percent outside air.

Store Vaccine in Chillrooms

Vaccine and virus, being perishable, require the use of chillrooms to provide suitable temperatures for storage. The three chillrooms are of conventional design, using direct expansion unit coolers with refrigeration supplied by water cooled reciprocating compressor units.

A central system provides the chilled water needed for sterile air conditioning equipment and other air conditioning needs. This 75 ton system uses a dry expansion water chiller and one 50 hp and one 25 hp direct driven compressor.

Packaging Building Conditioned

The final steps in the preparation of the vaccine for distribution are the filling, labeling, and packaging operations. These are all performed in an air conditioned building, utilizing clean, sterile surroundings in a manner similar to that employed on other biological ampoule products manufactured by the firm.

* * *

This month, in "Open for Discussion," beginning on page 103, readers comment on systematic maintenance, air conditioning multi-story buildings, and other topics.

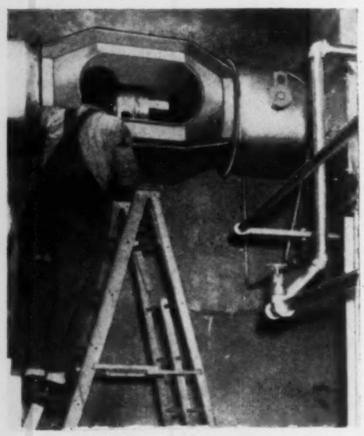
WHICH SHOULD YOU CHOOSE . . . .

Forced or Induced Draft?

Should forced or induced draft be used for heating boilers? There are many definite differences of opinion on this question. HPAC therefore asked several well qualified engineers to give their views, which are presented here as a "panel session" covering both sides of the subject. The authors are Martin G. Beline, Application Engineer, DeBothezat Fans Div., American Machine and Metals, Inc.; John M. Hartman, Manager of Research, Kewanee-Ross Corp.; Guy Mankin, Jr., Manufacturer's Representative, L. J. Wing Mfg. Co.; and James B. Rishel, Mechanical Engineer, James B. Rishel Co., Manufacturer's Representatives.

• *applying induced draft*

By Martin G. Beline



1 AXIAL FLOW INDUCED DRAFT FAN of the straight through type is accessibly mounted as a flanged section of the breeching ductwork

INDUCED DRAFT refers to conventional firing where the mechanical draft fan removes the products of combustion from the boiler breeching and discharges them to the atmosphere. The boiler is under negative pressure, and any leakage is infiltration through the setting and around the doors. Basically, induced draft fans are "synthetic chimneys condensed into small packages."

Forced-induced draft combination firing is generally used on larger boilers. In these larger boilers, forced draft is employed to overcome resistance in the preheater, if used, and the resistance in the primary and secondary ports. The forced draft resistance is relatively high and sometimes reaches 20 in. WG, depending on the type of boiler, type of fuel, heat exchangers, ductwork, and other factors.

Induced draft fans are used to overcome the following resistances to the flow of the products of combustion:

a) Negative pressure required in the firebox, usually between 0 and 0.15 in. WG.

b) Resistance through the boiler itself, at start up as well as at operating conditions. Scotch marine boilers range from 0.06 to 0.27 in. WG, whereas water tube boilers range from 0.18 to 0.76 in. WG and sometimes higher.

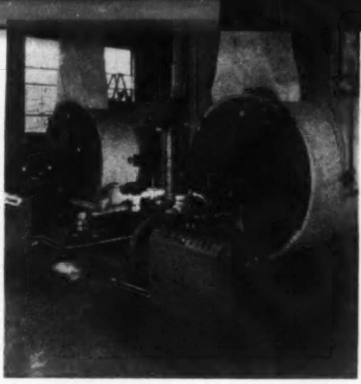
c) Resistance of the breeching, if any, including elbows, heat exchangers and fly ash collectors. This item must be figured for each job. Fly ash collectors range from 0.10 to 5.0 in. WG.

d) Resistance through the stack which has considerably less cross-sectional area than a natural draft chimney.

The static pressures on the induced

• forced draft has advantages

By James B. Rishel



2 FORCED DRAFT gas-oil burners produce sufficient static pressure to overcome burner throat loss and friction drop within boiler

FORCED DRAFT COMBUSTION in itself is not new, having been used for many years in industrial process work. The application of this type of combustion for space heating of buildings grew in popularity during the 1930's, when the first packaged boilers were produced. Since then, forced draft burners have been developed for other types of boilers, including the Scotch marine fire tube boiler and the smaller packaged water tube boilers.

The forced draft burner is designed to deliver the necessary air against the total pressure loss of the boiler-burner system. The principal draft losses are those across the burner throat and through the boiler passages. Also, the burner is constructed so that pressure combustion will not adversely affect the internal parts of the burner or cause carboning on the burner throat.

Slight modifications in conventional fire tube boilers were made at first to accommodate forced draft combustion. The principal change was the pressurization of the front and rear furnaces and the flue collector of the Scotch type boiler.

The firebox type boiler does not lend itself to pressurization and, therefore, is not ordinarily used without an induced draft fan. Continued research and development is being conducted to produce Scotch type boilers designed basically for forced draft combustion. In line with this, furnace and tube diameters have been reduced, and refractory lined rear combustion chambers have been replaced by all-wet-back chambers.

Scotch type boilers are available for forced draft combustion and may be selected against any rating system now in use whether it be the method advocated by the Steel Boiler Institute, the Institute of Boiler and Radiator Manufacturers, the Heating, Piping and Air Conditioning Contractors National Association code, or by manufacturer's certified ratings. It should be emphasized that the use of forced draft combustion does not dictate any particular method of rating the boiler. The problem of rating boilers has no part in this discussion of forced draft combustion. The SBI rating of steel boilers can be used

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draft side of a boiler add up to a total ranging from 0.20 to about 5.0 in. WG for most jobs.

Types of mechanically induced draft equipment in common use include the centrifugal fan and the axial flow fan.

The centrifugal fan has been used for this purpose many years. The larger induced draft units are normally of the double inlet type and are usually equipped with a forward curved multi-blade type fan wheel, the radial blade with forward or backward curved tip, or the conoidal blade. These fans can develop high static pressures, which are sometimes required on coal fired installations with fly ash collectors — static pressures ranging from 0.1 in. to 3 in. — or central station installations with heat exchanger type air preheaters.

Small induced draft units are usually of the industrial exhauster type. These units are low in cost and have the same characteristics as the larger units.

The axial flow fan has been well known for induced draft service the past 15 years. But during the past four or five years its application has increased. Variable speed motors are generally provided. In effect, they are "variable height chimneys."

Axial flow induced draft units are made in the "elbow" type and the "straight through" type. The principal advantage of the elbow type is accessibility for repair. Of course, a bearing is in the hot gas stream, although it is mounted in an insulated tube and ventilated when the fan is operating. High speed operation of these units also limits the application where the noise level is critical.

The straight through type mounts as a flanged section of stack or breeching ductwork and has no bearings in the hot gas stream. In fact, this type seldom has bearings other than in the motor. Its advantages are accessibility and an ability to develop high static pressures at low speeds, making it suitable for the exacting noise level requirements of churches, schools and auditoriums. Of course, the straight through unit must be shut down from one to four times a year to lubricate the motor. Also, if the stack is supported on the unit, the stack must be removed or braced in place so that the unit can be removed for major repairs. Where the straight through unit is part of the breeching or independently supported stack, access thimbles, adjacent to the unit, permit access to the fan wheels, the motor always being accessible.

In general, the motor requirements of the various induced draft fans are about the same, because centrifugal fan motors are frequently sized for the hot condition, whereas the axial flow units are sized for cold condition protection. Axial flow units can handle cold air at full speed without damage — cleaning or working on a furnace — whereas motors of some types of centrifugal fans, sized as indicated, should be run at reduced speed or the fans must be throttled.

with the maximum burner capacity being stipulated by the boiler manufacturer.

Two Scotch marine boilers with combination gas and oil burners of the forced draft type are shown in Fig. 2. Each boiler is pressurized and the burner fan produces sufficient static pressure to overcome the burner throat loss and the friction drop within the boiler itself.

The advantages of forced draft combustion are lower first cost and maintenance, and higher combustion efficiency. The lower first cost is due to the elimination of the refractory setting for the fire box boiler and the induced draft fan. These costs more than offset the cost of pressurizing the boiler, which generally runs less than $100 for fire tube boilers. Actual cost analyses for any particular job can be made by the consulting engineer and prove this.

Maintenance of the forced draft combustion system is simple, as there are no moving parts in the hot flue gas stream. On heavy oils Nos. 5 and 6, this is particularly important.

Claimed disadvantages of forced draft include (1) fan noise; (2) motor horsepower requirements; (3) special combustion patterns; and (4) possible escape of products of combustion into the building proper. However, most forced draft burners are designed around centrifugal fans of the squirrel cage type and the fan noise level is not excessive. Neither is the horsepower requirement. If the squirrel cage type fan is used, fan motor hp for the forced draft and induced draft systems is generally equal.

Complicated combustion patterns are not necessarily required for forced draft combustion systems. Special types of forced draft combustion equipment are in use on some boilers to achieve higher heat transfers.

Leakage of products of combustion into the building proper has not proved to be a problem, to my knowledge. The gasketing of the front flue collector, and the use of the all-wetback boiler construction has eliminated the possibility of products of combustion escaping into the building.

3 INDUCED DRAFT FANS must be able to withstand high temperatures, and provision must be made for cooling the bearings

• *boiler dictates kind of draft*

By John M. Hartman

NATURAL DRAFT from chimneys in modern low one story buildings is generally insufficient for operation of the heating boiler. Therefore, it becomes necessary to provide mechanical draft, either induced or forced. Each type has certain advantages. Theoretically, there is little difference. Induced draft draws the gases through the boiler, while forced draft pushes them through. Induced draft places the boiler under a partial vacuum, forced draft under pressure. The type of boiler, therefore, dictates the kind of draft to use.

Induced draft can be applied to any type of boiler that has been designed for natural draft, since it creates a suction at the smoke outlet of the boiler the same as would a chimney or stack.

Forced draft cannot be used unless the boiler is especially built for pressure combustion. This means gas-tight joints in the furnace and flue cleanout doors to prevent leakage

• *let's look at the facts*

By Guy Mankin, Jr.

THE TALL STACK is outmoded, not only from the architectural or aesthetic viewpoint, but also because its initial and maintenance costs call for a mechanical method to provide boiler draft.

There is much debate whether combustion efficiencies and the comparative economies are higher or lower with pressurized furnaces or the suction type. It seems that argument will continue for some time, until a more complete overall picture is obtained. However, certain facts are already known.

First, this discussion deals only with low pressure heating boilers. Accordingly, comparison here is only between pressurized and suction firing.

In pressurized firing, a forced draft fan with high static pressure characteristics must be employed to overcome the losses, not only in the burner register and throat, but also in the furnace, boiler flues and exhaust vent. Such a fan requires a relatively large motor. Also, in this fan, which is generally of the centrifugal type, noise may be objectionable. On the other hand, the suction type fan, which is generally the axial flow type, the motor size and electrical consumption is but a fraction of that required by the pressurized fan. This type is inherently quiet for this type of service.

It is difficult to estimate the price differences between the pressurized forced draft blower and the suction into the boiler room. It requires gasket construction. It is not practicable to construct the base, firedoors and flue cleanout doors gastight. Consequently, induced draft must be used with firebox boilers.

For converting from natural to mechanical draft in the field, induced draft is generally used.

The induced draft fan must have sufficient capacity to handle the required volume of flue gases for developing the maximum boiler output, and it must be capable of creating enough suction or static pressure to overcome the resistance through the boiler, furnace and burner. It is, therefore, necessary to know the draft loss through the boiler and furnace and the amount of draft required to draw the air supply through the burner.

In order to handle hot flue gases, the induced draft fan must be constructed with materials capable of withstanding high temperatures, and provision must be made for cooling the bearings.

The fan should be large enough to handle the greater volume of high temperature gases, and the fan speed low enough to avoid objectionable noise. There have been cases where high speed fans caused noise in the vicinity of the stack comparable to the exhaust of an airplane flying overhead.

From a standpoint of combustion, forced draft seems to have some favor over induced draft, especially when firing the Scotch type boiler. This is partially indicated by the fact that more manufacturers of boiler-burner units employ forced draft. It is claimed that there is better control of combustion over a wider operating range with forced draft. Higher CO_2 is possible.

Draft control with induced draft presents a problem that has not received too much attention, in my opinion. A fan of adequate capacity may be selected and installed with a barometric damper or fixed choke damper, or both, in the breeching between the boiler and fan. Such control may be satisfactory with on and off burner operation, but it is not entirely satisfactory with modulating high-low burner operation. Modulating operation calls for automatic control of the damper to maintain a constant furnace draft, but unfortunately such equipment is too often omitted because of its cost. The barometric damper aids both in draft control and in diluting the exit flue gases to prevent excessive fan temperatures.

An inherent disadvantage of the induced draft fan is control of the air supply at the start of burner operation. Until combustion has become established and the boiler warmed up so that the exit flue gas temperature is normal, the fan will introduce about twice the amount of air necessary for combustion. This is due to the fact that 1 cu ft of room temperature air is approximately twice the weight of 1 cu ft of air at the flue gas temperature.

This oversupply of combustion air at the start of the burner could cause excessive chilling of the fire and poor starting. However, it is probably not a serious disadvantage since there are countless installations of induced draft fans in service.

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induced draft fan, unless full design particulars are known. The boiler itself should cost less when used for suction firing, as it will not have to be gastight, requiring close fitting doors, gaskets, or extra stud bolts. Also, good construction practice for pressurized firing requires that the boiler gas outlet connections and vent stacks be similarly sealed to prevent leaks from internal gas pressure buildups. These extras further increase the cost over the suction type of boiler.

Soot, which accumulates in any boiler, requires periodic cleaning as often as once a week in winter. With pressurized furnaces, however, the additional work of removing the extra bolts and clamps, plus renewing the gasket seals, tends to discourage cleaning as often as it should be. In the suction furnace, on the other hand, there are fewer clamps and no gaskets. The tube doors can be opened quickly at random, permitting free access and ready cleaning. The fuel savings from a clean boiler as compared with a sooted one are substantial.

In suction firing, some losses occur from infiltration of cold air into the hot gas stream through leaks in the tube doors. The amount of this, however, can be largely controlled through induced draft fan speed adjustment to prevent this excess suction. Furthermore, the use of a barometric damper will help to eliminate this infiltration loss.

With pressurized firing, the type of boiler is almost exclusively restricted to the Scotch marine type. The Scotch marine is also used with suction firing, but the firebox type can also be employed. This increases the choice in the selection of boilers for suction firing. Thus, with the latter, solid fuels, either hand or stoker fired, can also be employed, should the fuel situation so dictate.

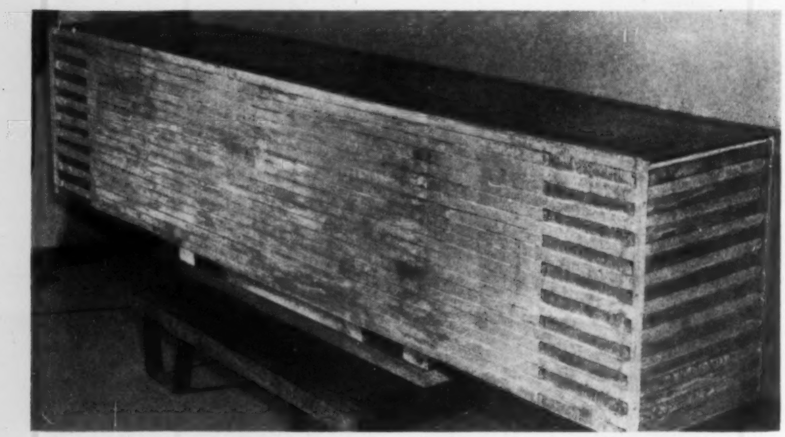
Undoubtedly, further improvements will in time be made in the performance of pressurized firing and in the cost of the boiler-burner combinations. Meanwhile, it is my opinion that suction firing costs less to install, less to maintain, and is more efficient and safe.

4 FAN SPEED ADJUSTMENT on induced draft fans to prevent excess suction can control infiltration of cold air into the hot gas stream

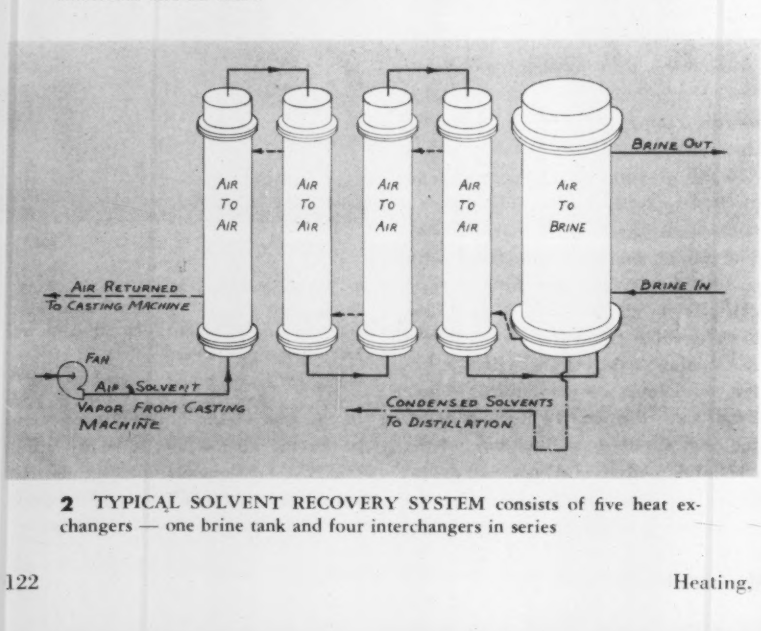
AT EASTMAN KODAK

Solvent Recovery Improved with Finned Plate Surface

Operating costs and space requirements for the film making solvent recovery process have been cut by the use of a heat exchanger with encased fin and tube coils and a high capacity finned plate interchanger.



1 INDIVIDUAL HEAT EXCHANGER UNIT, constructed of 10 cold air and 10 hot air passes, is assembled in alternate layers of sheet metal pass enclosures and fin slabs


AIR TO AIR
AIR TO AIR
AIR TO AIR
AIR TO AIR
AIR TO BRINE
BRINE OUT
BRINE IN
AIR RETURNED TO CASTING MACHINE
FAN
AIR & SOLVENT VAPOR FROM CASTING MACHINE
CONDENSED SOLVENTS TO DISTILLATION

2 TYPICAL SOLVENT RECOVERY SYSTEM consists of five heat exchangers — one brine tank and four interchangers in series

SOLVENT RECOVERY for Eastman Kodak Co. involves a lot of piping, and substantial savings have been achieved in this piping process in which a finned plate heat exchanger is used at the Rochester, N. Y., plant.

In the manufacture of photographic film, cellulose esters which have been dissolved in organic solvents are continuously deposited on large revolving rolls known as casting machines. The solvents are evaporated with hot air, leaving a thin clear sheet known as film base, which is then stripped from the roll. To make the process economically feasible, it is necessary to recover the solvents.

One method of solvent recovery used by the Eastman Kodak Co. employs brine to cool the air-solvent vapor mixture and condense the solvents. This mixture is removed from the film casting machine with solvent concentrations in the range of 0.5 to 3.0 percent by weight, and in order to provide condensation with these small concentrations of vapors, it is necessary to cool to rather low temperatures. Both −35 F calcium chloride brine and −85 F methylene chloride brine are used, depending on the solvents to be condensed. The mixture of recovered condensed solvents is refined by distillation and the solvents are re-used.

How Recovery System Works

The solvent recovery system is shown in Fig. 2. It consists of five heat exchangers; one is a brine tank and four are interchangers in series. The brine tank is supplied with low temperature brine, which provides cooling for the system, and condenses the major portion of solvent. The

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and

J. N. Tomlinson

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interchangers transfer heat between the incoming and leaving streams, thus precooling the warm, vapor laden air and reheating the stripped air for re-use in the casting machine. For many years, conventional shell and tube exchangers have been used for both purposes.

Later, a plate type interchanger made up of a series of flat plates spaced ½ in. to 1 in. apart was used. The rectangular passages between the plates carried hot, vapor laden air and cold air countercurrently in adjacent alternate passages. The same type of shell and tube brine tank was used on the low temperature end of the system.

Fin and Tube Coils Encased

The arrangement now used substitutes encased fin and tube coils for the brine tank exchanger, and uses a high capacity finned plate interchanger.

The finned plate interchangers have improved the performance by means of secondary surface. This is accomplished by bonding together layers of fins and separator sheets to form unit exchanger sections. A bank of the finned plate units is manifolded together and sealed in a sheet metal casing.

The individual heat exchanger units shown in Fig. 1 are approximately 16 in. × 20 in. in cross-section and made in 4½ ft and 7½ ft lengths. Each exchanger unit consists of 10 cold air passes and 10 hot air passes, and is assembled in alternate layers of sheet metal pass enclosures and fin slabs.

The fins are a channel shaped stamping, the legs of which are offset to allow for uniform spacing when stacked into a slab assembly.

The fin slabs and sheet metal pass enclosures are bonded together in a special furnace. End extensions are attached to the heat exchanger sections to facilitate manifolding. The sections are then assembled in the sheet metal casing and the end extensions welded together.

In order to get a degree of rectification, a surface was desired that would direct the condensed solvent away from the separator sheet or wall to the warmer midpoint of the counterflowing air stream. However, when an experimental section was made with such a fin, it was found that while the louvers directed the solvent flow to the center of the fin, the solvent was also directed primarily to one face, resulting in one surface being starved and the other receiving an excess. This did not provide the maximum rectification which would be possible if all surfaces were used uniformly. Three more fins were tried, but none of these was completely satisfactory. The final result was a fin that had a low friction loss.

Extensive heat transfer tests were conducted in all of these trials. The procedure used was to form fins from temporary hand dies and tools and build up small test samples. These test sections had only a single air pass with a face area of 3 sq in. and a 3 in. length of flow.

The choice of a short flow length was dictated by the need to maintain sufficiently high end temperature differences which permit accurate log mean temperature difference calculations. The section was provided with a steam jacket on both walls.

The technique of this test procedure had been previously developed for the testing of strip fin surfaces used in high efficiency gas-to-gas heat transfer units. One might be dubious as to results obtained from such small test cores, but the technique developed gave excellent correlation between the test samples and the large scale units.

A 6 ft long test sample three passes high and 3 in. wide was fabricated. It was placed on stream and given a performance check, which indicated theoretical design calculations were correct.

The average operating conditions for the three systems — the formerly used shell and tube, the plate type and the finned plate arrangement — are shown in Table 1.

The low heat transfer coefficients inherent in gas-to-gas heat transfer require the use of a large amount of heat transfer surface, and the finned plate interchanger concentrates great heat transfer area in a small volume. In the case of this process, the area volume ratio was increased by approximately 10 times over the units formerly used.

As indicated in Table 1, a log mean temperature difference of 21 F is practical with the finned plate design, while the old shell and tube design provided a log mean temperature difference of 39 F. This improvement, brought about by the finned plate heat exchanger, has resulted in substantial savings.

A further cost saving was accomplished by using the available refrigeration in the cold recovered solvent. A special gas-to-liquid exchanger was developed with the same type of finned plate surface on the air side and narrow, smooth-finned liquid passes intervening. This unit serves to cool and condense a separate bypassed stream of vapor laden air, and at the same time, raise the recovered solvent temperature.

TABLE 1—AVERAGE OPERATING CONDITIONS are compared here for the three different systems: the formerly used shell and tube, the plate type, and the finned plate type

	Shell and tube	Plate	Finned plate
Entering temperature, hot, F	156	138	176
Entering temperature, cold, F	−74	−87	−68
Leaving temperature, cold, F	117	112	155
Log mean temperature difference, F	39	26	21
Pressure drop, in. of water	13.0	13.7	12.0
Overall heat transfer coefficient, Btu per hr per sq ft per F	2.2	3.3	4.9

Beer for the Gods

Are Air Conditioning Engineers 20th Century Medicine Men?

By F. W. Hutchinson
Professor of Mechanical Engineering
University of California

• Man has almost always sought to improve his environment. As the price for rain, the tribe of one village offered beer to the gods. In a tropical hotel, the owner reverses his role as a medicine man and offers free drinks to the customers. But such primitive methods of obtaining comfort are unnecessary today. Modern air conditioning, based on Fahrenheit's temperature research 250 years ago, is hailed here as "the environmental medicine for our age" by the well-travelled author of this article.

IN THE TROPICAL REGION of a certain Central American country the story is told of an air conditioning system that has brought great satisfaction to the many guests of a small hotel. The system has never been in operation and there is every reason to believe that it never will be — but it nonetheless has gained a well-deserved reputation. According to the story, the owner purchased a small refrigeration unit powered by an electric motor. But electricity has not yet been introduced into the town — except for a small portable unit supplying light to the municipal building — and available cooling water is at a temperature greater than the critical temperature of the refrigerant. Thus, the unit cannot be started — and, if the day ever comes when electricity is available, the refrigerant will not be able to be condensed and the capacity of the system will therefore be about nil.

Yet in spite of the above difficulties, the "air conditioned" hotel is said by most of the guests to be the coolest in town and it has an enviable local record for regularly returning customers. The owner, a man of imagination as well as acumen, provides iced rum drinks without charge and, in his accounting, the cost of the rum is charged against operating costs of the air conditioning. Callous and unimaginative visitors have been known to suggest that the free rum is a bribe — though a very effective one — to persuade the customer that the advertised comfort of the air conditioning is synonymous with the "comfort" of the drinks.

Before Engineers

With modern methods of air conditioning there is no longer just reason for providing consolation in place of comfort — but in the past such a procedure occurred so frequently as to represent almost the norm. In the days when wizards and medicine men attempted what is now done by engineers, the frequency of failure was so great that some kind of hedge was almost a necessity. Some of the devices used by the tribal priests to provide protection against disappointed and irate "customers" are closely akin to the hotel owner's method of satisfying his guests.

Thus, Sir James Frazer tells of the rain-making methods of the natives of Central Angoniland: The entire village brought quantities of beer to tribal wizards located in a central rain temple. A small amount of beer was placed in a pot, buried in the earth near the temple and offered as a present to the gods in anticipation of their favor in bringing rain. As a protection against lack of success, however, the entire tribe then consumed the remaining beer — and one may suppose that the disappointment following failure of the rains to come would be largely offset by the pleasant anticipation of repeating the rites.

Was Fahrenheit Sick?

Although modern air conditioning has long since eliminated the need for rites and offerings as a means of obtaining indoor comfort, it is nonetheless (and rather amusingly) dependent even to this day on the work of an early scientist who was either a careless experimenter or a sick man. Some 250 years ago, a research worker named Fahrenheit decided to seek some standard method of determining temperature. Exactly what happened, we shall doubtless never know, but his procedure can be tentatively reconstructed. In order to develop a scale of temperature, need existed for using some object which would change in a fixed way with changes of temperature. Further, some standard or reference temperature was needed which would be commonly known and readily duplicated. But in order to express numerically the departure of any temperature from the reference value, a second standard was needed.

As a primary reference, Fahrenheit selected the temperature of the human body. Experience had shown that body temperature was very nearly the same for all normal people and remained the same, independent of changes in weather or in season; thus, this temperature offered a simple, convenient and generally recognizable standard. As a secondary reference, Fahrenheit decided to use the lowest temperature that could — at that time — be repeatedly duplicated by natural means; to do this he prepared a mixture of salt and ice water.

In calibrating his proposed thermometer, Fahrenheit inserted the glass enclosed mercury column in his mouth and presumably waited until the mercury ceased to expand. He then made a scratch mark on the glass at the mercury level and announced that this mark — corresponding to body temperature — would be defined as 100 deg of temperature. The secondary reference provided a scratch mark at a lower temperature, and this was arbitrarily defined as 0 deg. By dividing the distance between the two references into 100 equal divisions and extending the scale beyond 100 deg, it was then found that an additional pair of common references — ice and boiling water — were represented on the Fahrenheit scale by 32 deg and 212 deg of temperature, respectively.

But we all know that normal body temperature on the Fahrenheit scale is at 98.6 deg rather than at 100. Thus, something necessarily went amiss during the calibration of the thermometer. We shall never know whether Fahrenheit accidentally placed the scratch mark for 100 deg too high on the glass column or whether he was ill at the time; in the latter event, he provided all future men with a permanent record of the fever experienced by one man. Fortunately for us, it makes no practical difference whether the scientist was careless or was ill. Although we use the thermometric scale which he developed, we use it with modern calibrations which assure duplication of results and thus enable us safely and accurately to compare the temperatures of any two persons or any two objects. In absolute terms, the readings of the Fahrenheit scale have no practical significance, but as a basis of comparsion — the only use for which the scale was developed — it is just as effective and just as exact as it would have been if Fahrenheit had been either more careful or healthier.

Human Thermostat Sensitive

At the time of Fahrenheit's work, the lower reference point — at zero deg — was considered to correspond relatively closely to the lowest possible temperature. Since then, however, man's concept of "cold" has developed greatly and we now know that temperatures approaching absolute zero — at minus 460 deg on the Fahrenheit scale — exist in interstellar spaces. A comparison of the absolute and the Fahrenheit temperature scales provides an interesting analogy between the permissible range of temperature within the human body and the corresponding range of external comfort temperature. Thus, any departure of body temperature of more than approximately 1 F from the norm of 98.6 F denotes an abnormal physiological condition and, over a prolonged period of time, would represent a hazard to the health of a normal man. It appears, therefore, that the human "thermostat" must maintain control of body temperature within a range of less than plus or minus 1 percent on the Fahrenheit scale.

With respect to the external environment, the situation is surprisingly similar. An average, very lightly clothed, man — seated and at rest — will experience optimum comfort only within a range of plus or minus 5 F to 10 F from 70 F on the Fahrenheit scale. This does not mean, of course, that severe discomfort exists outside of this temperature range, but it does mean that the majority of people would be aware of either excess heat or excess cooling effect. Noting, now, that absolute zero occurs at −460 F, it is evident that 70 F is 530 deg above absolute zero. Thus, on the absolute temperature scale, a 5 F variation from 530 F would constitute a 1 percent departure from the norm. Optimum comfort thus requires — for a lightly clothed sedentary occupant — control of the environment within plus or minus 1 or 2 percent on the absolute scale.

Environmental Prescription

When body temperature departs by 1 percent on the Fahrenheit scale from the norm of 98.6 F, the patient is likely to ask the help of a doctor to correct the situation. When environmental temperature departs by 1 percent on the absolute scale from the norm of 70 F, the "patient" is likely to ask the help of either a clothier or an air conditioning engineer. Modern heating and air conditioning equipment is an engineering "medicine" — applicable to the ills of man's external environment — which resembles in effectiveness the medicines, like sulfa and penicillin, which assist so greatly in correcting the ills of man's internal environment. Just as there is no patent medicine that can be used as a cure-all — the capable doctor compounds an individual prescription to meet the particular needs of his patient — similarly, there is no single type of heating or cooling system that will meet the needs of every structure. It is in the "compounding of the prescription" — the selection of equipment and the design of the system — that the skill, knowledge and experience of competent engineers and contractors are exercised to the advantage of the owner.

In time, thanks to Fahrenheit, one of engineering's earliest "medicine men," and to modern air conditioning technology, the small Central American hotel may give up its colorful non-functioning cooling unit for an efficient custom designed system. The hotel would then live up to its reputation as being "air conditioned," and there might conceivably be a little more beer portioned to the gods.

Turn Back Time To Aid Remote Mission

. . . resurrect 40 yr old "damper flapper" control to provide automatic heating with hospital's hand fired steam boiler

ANCIENT BOILER REGULATOR, powered by battery, was repaired by engineers and donated to a Navajo Indian mission hospital 35 miles from an electric power line in southern Utah.

AT SAINT CHRISTOPHER'S Mission to the Navajo, near Bluff, Utah, Brother Juniper, O.B.S.F., has been trying to overcome lack of funds and other overwhelming odds to erect a modest hospital for the people he serves.

Here, in the land of the Navajo far from any city, 35 mi from an electric power line, the nearest Indian service hospital is 150 mi away. That is why Brother Juniper is struggling to build his own hospital. He's still got plenty of problems but he has just cleared one major hurdle — that of providing automatic heat despite the fact that the hospital has no continuous source of electricity, according to the Minneapolis-Honeywell Regulator Co.

Because Brother Juniper is using a hand fired steam boiler and because there is no continuous electricity, he was told there was no way to control the boiler without running up and down the basement stairs to do it by hand. He remembered that when he was a boy, a similar boiler was in their home, and it was controlled by a hand wound, clock like mechanism with a chain that opened and closed the damper automatically.

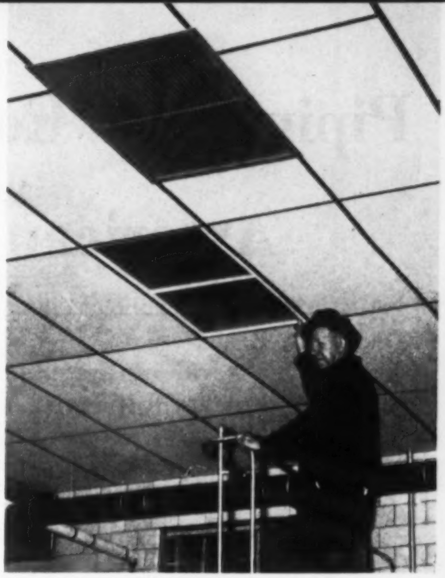
A search was conducted for one of the old "damper flappers" and one was found — about 40 years old — that had recently been removed from a building. The engineers took the control apart and repaired and rebuilt the ancient spring wound motor. They added a modern thermostat, safety control, compiled the instructions on how to install the unit and sent it to Brother Juniper with their good wishes.

"If this 20th century version of the 'damper-flapper' works as well as the one we had at home," the missionary said in a letter of thanks, "I am sure it will be fine."

Air Conditioned Dairy

. . . hides ducts and pipes for sanitary and architectural reasons

By E. C. Manthei
Consulting Engineer



EXHAUST GRILLES are located and sized to fit spacing required by suspended panel ceiling, which includes and supports lighting fixtures

THE DAIRY products plant of L. S. Heath & Sons, Inc., in Robinson, Ill., is one of the finest and most modern in the nation, according to dairy engineers who have visited it. In a recently completed addition are new rooms for cartoning milk and for processing cheese, as well as six air conditioned offices.

In designing the heating, ventilating and air conditioning systems, all piping and ductwork had to be kept out of milk and cheese rooms.

Central Unit Handles Air

The milk carton storage room, above the milk cooler room and adjacent to the milk and the cheese room, was a natural place to install the central air handling unit. The main ductwork is in the storage room also, with supply and return air grilles in the tile walls of the two work rooms.

The preheat and reheat coils in the unit are supplied by steam from a central plant through a pressure reducing valve, with steam to the coils being controlled by throttling type steam valves. The unit delivers 100 percent outdoor air for summer ventilation. But in winter, variable amounts of outdoor air are combined with return air in a mixing chamber in the return duct, before being filtered. The unit provides 7½ air changes per hour in the cartoning and cheese processing rooms.

Because the amount of make-up air is varied from the summer cycle to the winter cycle, the power roof ventilators, equipped with two-speed motors, are used to keep the air in balance. They operate at high speed for maximum summer ventilation and at low speed in the winter and are turned off for the night cycle. The fan speed is selected manually.

Joist Space Ventilated

The power roof ventilators are connected to exhaust grilles in the ceilings by ductwork through the joist space. The joist space is ventilated by air intake louvers from the outside walls, with the air being exhausted by the power roof ventilators through openings from the joist space to the fan suction. Ventilation of the joist space is necessary to prevent condensation from occurring above the ceiling, as a result of the high humidity conditions in the work rooms.

Electric temperature controls are used for the heating and ventilating cycle. For the heating cycle, a mixing control in the mixing chamber controls outdoor air and return air dampers to maintain a minimum mixed air temperature of 40 F. A room thermostat controls the reheat and preheat coils by throttling steam valves in sequence. A limit control in the fan discharge housing prevents air from entering the room below 60 F. The outdoor air damper closes when the fan is not operating.

New Offices Air Conditioned

A self-contained air conditioning unit provides both cooling and heating for the six new offices, with all supply ductwork installed above a suspended ceiling. In the branch duct to each office, a damper positioned by a manual remote controller provides a means of changing the air balance during the cooling cycle.

The air enters the room through ceiling type air diffusers, integrated with lighting fixtures as part of a suspended ceiling of acoustical board, all supported on one system of aluminum tees in a symmetrical pattern.

The return air leaves the rooms through grilles in the office doors and travels through the corridor to an intake grille on the unit, or through an exhaust grille in the ceiling to a power ventilator on the roof. An outdoor air intake connects the return air duct before entering the unit.

Pneumatic type controls are used for the heating and cooling cycles. During cooling, the room thermostat controls the compressor. The fan is operated manually. During the heating cycle, a day-night thermostat controls a modulating steam valve to the coil, and a low limit control in the fan discharge is set at 60 F. An aquastat stops the fan if there is no steam at the unit. An outdoor air damper closes when the fan is not operating, and a gradual outdoor air switch manually controls the amount of outdoor air admitted.

Piping, Air Conditioning Discussed at American Power Conference

Several of the papers given at the 17th Annual American Power Conference, sponsored by the Illinois Institute of Technology, proved of interest to HPAC readers. Extensive summaries of four of the papers are presented here.

Demineralizing Boiler Feed Make-Up for Paper Mills Pays

The reduction of boiler scale in the steam plant by using demineralized water cut blowdown to less than 1 percent, diminished the required boiler make-up by 20 percent, and added 3 percent to the total boiler capacity, reported T. J. Judge, Division Power Engineer, and C. L. Davis, Jr., Chemical Engineer, of the International Paper Co.

THE DEMINERALIZATION of water, by virtue of its excellent effluent, is fast becoming the most preferred method of treatment for boiler feedwater make-up. This is particularly true in the steam plants of the pulp and paper industry, where the amount of boiler water make-up is 40 percent or more of the total steam flow.

This industry requires large quantities of process steam at pressures ranging from 5 psig to 155 psig for drying paper, cooking pulp in the digesters, heating water, and many other miscellaneous uses. The boiler pressure in earlier facilities was normally between 175 and 200 psig. This was only sufficient in most instances to allow for the pressure drop in pipe lines and control valves.

Improves Plant Performance

Good treatment of boiler water make-up is reflected in the steam plant's performance. The use of demineralized water has contributed materially toward reducing maintenance, improving efficiency, and increasing availability of equipment. The most outstanding improvements are the reduction of boiler scale, the elimination of harmful carryover in the steam, and the reduction in boiler blowdown.

One particular plant provides the most comparable example, since it was installed to supply a steam plant that had been troubled with boiler water problems for more than 20 years. It is unfortunate that detailed efficiency data and maintenance costs are not available for an economic comparison. However, the improvements that have resulted since the installation was made 18 months ago are of interest.

During a prior equivalent period, the boilers had been given 36 cleanings by hand and six by acid. Each of the large turbines had to be inspected internally at least once per year, and frequently washed between inspections to remove deposits from the blading. These deposits would occasionally cause as much as 20 percent loss in capacity within a period of 60 days. On recent inspections, the boilers and turbines were found to be very clean. There was no evidence of boiler scale or deposits on the turbine blading.

Cuts Maintenance Costs

The boilers are now operating with a blowdown of less than 1 percent, whereas previously 10 to 11 percent was required to keep solid concentration within safe limits. The savings in blowdown have reduced the required boiler make-up to 20 percent, and have added at least 3 percent to the total boiler capacity. It is the opinion that a large maintenance saving is realized and a better heat transfer rate is obtained by eliminating the high CO_2 carryover with the steam. Erosion in the heat exchanger equipment and condensate piping, fittings, traps, and pumps has been considerably reduced.

Preventing High Pressure Steam Valves from Sticking

The stem material for high temperature valves must be carefully chosen, and the valves must be tested regularly, to avoid sticking. The stem material should have: (1) high temperature rupture strength; (2) the same coefficient of thermal expansion as the bushing; (3) high anti-galling properties; and (4) high corrosion resistance. These points were made by C. L. Mead, Design Engineer, General Electric Co.

THE STICKING of high pressure steam valves has caused increased maintenance in power piping in recent years, particularly as a result of the higher operating temperatures. Plant engineers are learning that high temperature valves are more susceptible to sticking, and that they must be tested regularly to assure their ability to close instantly.

Choosing a Stem Material

Several factors play an important part in choosing a stem material for high temperature service. First, the material must have a high temperature rupture strength to withstand high stress levels for short periods of time. High forces are necessary to start lifting an unbalanced, single disc type valve against the high steam pressures of today. Larger stem diameters could be used, but this would result in increased steam leakage. Also, larger control valve springs would be required to overcome the increased stem blow-out forces, which would necessitate larger hydraulic operating pistons and larger oil pumps. Larger pumps and increased steam leakage both result in loss of efficiency. Thus, high stress levels in tension are imperative. Bending stresses are also important near the end of the stems because of the side forces on the crossheads which lift the stems. The material should also be metallurgically stable at the operating temperatures.

Maintain Close Clearances

Second, close clearances between stems and bushings must be maintained to keep the steam leakage to a minimum, thereby reducing loss of efficiency. To maintain these clearances throughout the temperature range it is necessary to make the stems and bushings of materials having the same coefficients of thermal expansion. Valve stem chatter is also prevalent when larger stem clearances are used.

Third, the stem and bushing materials, whether they be of the same or dissimilar metals, must have high anti-galling properties when rubbed together. Materials which gall would be worse than oxide build-up because of the inability to forecast when galling would occur. Only a small amount of galling is necessary to prevent a valve from closing.

Fourth, the materials used must be made as highly corrosion resistant as possible. This may be done in the base material or in surface coatings applied to the stems and bushings.

How Filming Amines Control Corrosion in Piping

Filming amines, applied in low, economical dosages, effectively control corrosion in steam condensate systems and on condensing surfaces, sharply reducing maintenance costs. Inhibitor dosages are independent of dissolved gas concentrations, since filming amines do not function by neutralization. Filming amine inhibitors increase heat transfer efficiency by removal of corrosion deposits, and promotion of dropwise condensation.

Pitfalls to be avoided in filming amine application are presented here. Even though general rules for successful application are established, each plant must be studied individually to insure most economical and efficient use of these film-forming inhibitors. These points were made by J. F. Wilkes, Director of Research and Product Development, and Dr. W. L. Denman, Directing Chemist, Dearborn Chemical Co., and Dr. M. F. Obrecht, Chemical Engineering Dept., Michigan State College, in their paper.

STEAM CONDENSATE dissolves both ferrous and nonferrous metals, and the rate of attack is increased by dissolved oxygen and by acidic gases. Properly designed and operated external treatment processes will reduce oxygen and carbon dioxide in steam to a minimum. However, oxygen may enter condensate systems through leakage. Also, traces of carbon dioxide may concentrate at various points in the system and will cause accelerated corrosion.

Nitrogen containing compounds, of

which amines such as octadecylamine are typical, currently provide the most effective chemical control of corrosion in steam condensate systems. Both ammonia and amines have been used in power plants for control of corrosion, reduction in iron pickup and other protection. These agents function by neutralization of CO_2 and by adjusting the pH of steam condensate. Filming amines protect against both dissolved oxygen and CO_2 attack.

Preparing and Feeding Amines

The feed solution should contain a concentration of about 1 percent. The maintenance of the solution temperature at about 165 F facilitates pumping.

Standard chemical pumps are suitable and are recommended for applying filming amines to piping systems. Eductors or venturi feeding to the suction side of the boiler feed pumps may be used. Slug feed using a bypass or condensate feeders is not recommended because of the nonuniform feed rate.

Where to Apply Amines

Filming amines and their salts may be fed at any of the following points:

a) Direct to boiler water.
b) Direct to steam lines.
c) To boiler feedwater lines — following feedwater heaters — under certain conditions.

Application through the boiler feedwater lines may introduce problems and should not be considered if the feedwater has appreciable hardness, alkalinity, or other salt content, or if the systems include economizers or closed heat exchangers.

Application to boiler water or feedwater insures addition of free filming amines to steam by distillation. Application direct to steam lines is advantageous when it is desired to inhibit only a portion of the steam system against condensate corrosion.

When filming amine treatment is started in a corroded system, the inhibitor attaches itself to metal surfaces and loosens the bond between corrosion products and metal. If corrosion products are removed too rapidly, they clog traps, screens, and other equipment. Such difficulties may be minimized by starting at a low treatment rate.

Avoid These Pitfalls

1) Contamination of steam by oil or boiler water carryover decreases filming amine effectiveness. The detrimental effect of oil may result from desorption mechanisms. Since moderate increase in pH values enhances the effectiveness of filming amines, it is unlikely that boiler water alkalinity contributes to observed detrimental effects. Other inorganic anions may displace adsorbed amine molecules by a reaction similar to ion exchange.

2) Filming amine salts such as octadecylamine acetate must not be mixed with other water treating chemicals. Such mixtures will cause immediate formation of sticky precipitates, which clog mixing and pumping equipment.

3) Application of filming amines ahead of open feedwater heaters, closed heat exchangers, or economizers should be avoided. Filming amines may contribute to deposit formation in such units, in the presence of other contaminants.

4) Excessive feed rates at the start of filming amine treatment may cause excessive maintenance and service interruptions, by accelerated fouling of traps, screens, and pumps with displaced corrosion deposit agglomerates.

5) Processes such as bonderizing, electroplating and mirror silvering, which require chemically clean surfaces, may be adversely affected by presence of filming amines in condensate used for rinse operations.

6) In isolated instances, filming amine treatments have been reported to cause erratic operation of electrically operated liquid level controls, through film formation on electrode surfaces.

Filming amines have been observed to interfere with operation of conductivity cells, through film formation on electrode surfaces, which changes the cell constant, and produces misleading indications.

7) Filming amine treatment of steam improves heat transfer rate in heat exchangers, both by eliminating

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Electric Utilities Gear to

Air conditioning is causing summer peak loads, upsetting the traditional balance pattern of the electric utilities. To meet the new demands, transformer sizes are being upped, service conductor sizes are being increased, and high minimum power factors are being set. This was explained by Fischer Black, Publisher & Editor, Electrical World.

FOR THE COUNTRY as a whole, the impact of air conditioning is beginning to show up in the summer peaks. In 1953 and more predominantly in 1954 the change became very evident. Each year the summer peak is catching up with and passing winter peaks in more systems.

The predominant winter peak for which most systems were designed stands to lose its importance. Similarly, the extra capacity in transformers and lines due to low ambient temperatures at the time of peaks and increased output of generating equipment with low circulating water temperatures are lost.

Transformers Fail Under Loads

The temperatures during hot days along with heavy loading of distribution transformers cause many failures since in the past the winter loads were the limiting factors. Union Electric Co., St. Louis, had 100 transformer failures in one day during last summer's heat storm.

corrosion deposits and by apparently promoting dropwise condensation of steam. When transferring heat to certain liquids, or materials such as wet paper, substantial increases in heat transfer efficiency may be realized. However, careful analysis of the heat transfer system is necessary before one can economically justify the use of these materials on the basis of improved heat transfer. For example, in air heating systems the overall efficiency increase is small due to the high resistance of the air film.

Extensive pilot plant and field work now in progress indicates, in many cases, that substantial improvement in heat transfer and appreciable savings can be realized by the use of these filming amines.

Following are four case histories from different industries, showing some of the difficulties and results in amine application.

Treat Heat Exchanger Tubes

A vegetable oil extraction plant built in 1950 included rising-film evaporators and numerous heat exchangers, in which tubes failed rapidly by corrosion at lower ends. After two years of service, the plant had to be shut down for complete retubing of heat exchangers, at a cost of $25,000. After retubing, flaked octadecylamine acetate treatment of steam was started at 2 ppm. In 2½ years' subsequent operation, no tube replacements have been required; measured corrosion rates have dropped to a minimum; and internal inspection shows negligible corrosion. In addition, the process evaporation rate has been increased from 90 gpm to 160 gpm through improved heat transfer, traceable to the elimination of corrosion deposits and the promotion of dropwise condensation on the steam side of evaporator tubes.

Applied to Deaerating Heater

In a paper mill, it was applied to feedwater in the storage section of a deaerating heater, supplying a 600 psig boiler and low pressure units. Gradually raised to 1.5 ppm, the treatment arrested corrosion in paper machine air heaters and return lines. However, after six months, inspection showed that sticky deposits, largely consisting of octadecylamine and precipitated phosphates, had developed on economizer tubes at top and bottom headers. No deposits were found in feedwater lines or boilers. After cleaning economizer tubes, the chemical feed system was repiped to discharge the amine solution to steam headers. In addition to other benefits to production, direct labor savings resulting from elimination of corrosion in condensate lines have been estimated at $10 per day.

Building Heating Problems

In a government hospital, amine treatment reduced corrosion rates in a condensate system by 87 percent within five months. In three other buildings, corrosion rates in heating system returns were reduced from 51, 18 and 37 mils per year to 1.2, 1.2, and 2.6 mpy, respectively.

At a midwest university prior to starting amine treatment, corrosion attack due to dissolved oxygen leakage in branch returns was severe. Dissolved iron in condensate precipitated and formed deposits in main return lines, downstream from branch line discharge points. Differential aeration corrosion beneath these oxide deposits caused rapid penetration of return lines. Treatment removed accumulated deposits and arrested corrosion.

Lumber Kiln Lines Treated

A group of lumber mills located in the Pacific Northwest experienced severe corrosion of dry kiln condensate lines. In one instance a new dry kiln in operation only three months required complete replacement of piping assemblies. Other units experienced corrosion failures of return lines in 15 to 30 days. Application of filming amine at dosages of 1.5 to 3 ppm arrested corrosion and sharply reduced maintenance costs.

In a California mill, the replacement of corroded pipe in dry kilns had become routine Sunday practice. After starting filming amine treatment, corrosion failures were stopped. It was possible to eliminate overtime and Sunday maintenance operations, saving $5,000 per year.

Meet Demands for Air Conditioning

Transformer capabilities come down to 110 percent of nameplate rating due to the continuous hot weather, whereas the loadings climbed to levels well above the winter maximum demands.

Room Coolers Need High Voltage

Many room coolers have been installed on 115 volt circuits. The low voltage due to the excessive current at the low power factor on 115 volts makes the coolers inoperative. Union Electric Co. experienced excessive voltage complaints during the hot spell last summer, having as many as 284 during the hottest day.

Last summer a joint committee of representatives from the Air-Conditioning and Refrigeration Institute, Edison Electric Institute, and National Electrical Manufacturers Association decided on a new set of minimum power factors for room coolers, effective with 1956 models. Minimum values set were 75 percent for 1/3 hp units, 80 percent for 1/2 hp and 85 percent for 3/4 hp and larger. It appears that these standards will even be exceeded by some manufacturers.

Service conductor sizes are being increased to reduce voltage drop and secondary main sizes increased from No. 6 and No. 4, to No. 2, No. 1/0, or No. 2/0 conductor. Transformers are being placed closer together on every second or third pole and sometimes on every pole.

Transformer sizes are going up from 10, 15, and 25 kva, to 37½ and 50 kva, and the maximum ratings reduced to from 110 to 130 percent of nameplate for summer temperatures.

Primary voltages are being increased to improve voltage conditions and wiring capacity.

To gain capacity and improve voltage last summer, Kansas City Power & Light Co. grouped in parallel low voltage capacitors which were connected in series on primary circuits.

Series capacitors of 240 volt capacity, connected in the primary neutral lead of more than 250 transformers, solved many of the voltage troubles of the Public Service Co. of Oklahoma. Low voltage capacitors are connected on ends of secondary mains, where several services are tapped off. The results are good.

Increase Transformer Capacity

Booster transformers were installed for customers serviced by Arkansas Power & Light Co.

Air conditioning has prompted Union Electric Co. to spend $4½ million this year over and above its regular construction budget. This will go into strengthening its distribution system and enlarging transformer capacity at 6000 locations. This is typical of companies in the middle west and south central region, where the Southwestern Gas & Electric Co. upped its distribution budget 39 percent.

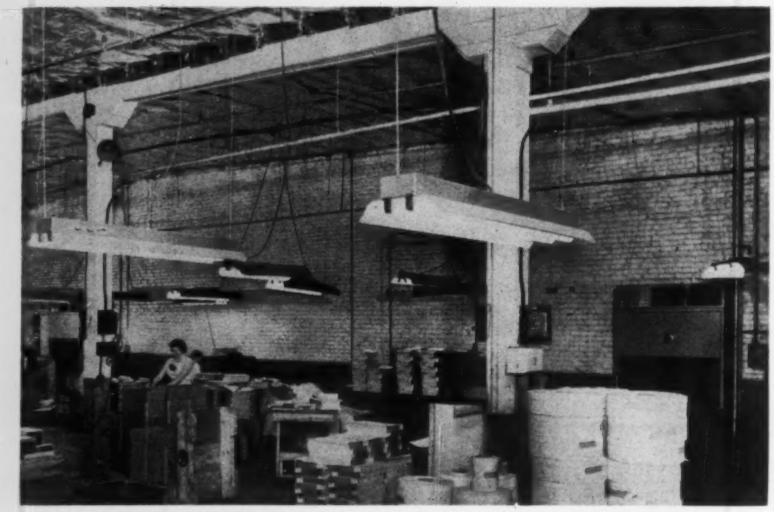
It is inexpedient to increase rates for this single service, so other solutions must be found. The best answer seems to be the promotion of year 'round air conditioning — cooling in summer and heating in winter. The heating can either be accomplished with heat pump, or electric resistance, or panel heating.

Thoughtful Planning Needed

Perhaps the problems growing out of air conditioning have been overemphasized here. If this is the case, it was for the purpose of stimulating more thoughtful planning toward the successful handling of this great new opportunity for sales of equipment for manufacturers and load building for utilities.

Air Condition Printing Plant with Packaged Units

. . . aluminum ceiling insulation installed



PACKAGED AIR CONDITIONERS keep paper stock easy to handle and employees comfortable in one of several air conditioned departments. Aluminum ceiling insulation reduced the cooling load by 50 tons

AIR CONDITIONING of the entire plant of the Cullom and Ghertner Co., printers and lithographers, Nashville, Tenn., has been recently completed, according to the Airtemp Div. of Chrysler Corp.

At first, the company was skeptical of the benefits and doubtful if the benefits would justify the expense. "Now we hardly know how we got along as long as we did without it," comments an official. "We are convinced that it is paying its way, not only justifying the expense involved but giving us additional production as well. Our people are comfortable on their jobs, and their work goes steadily forward. Also, air conditioning keeps paper stock in better condition to print, and rollers on presses last longer because of the even temperature that is maintained."

The Cullom and Ghertner plant has 50,000 sq ft of floor space, all on one floor, covered by a flat roof. Brick walls divide the interior of the building into several sections. Each section, plus the cafeteria, has been air conditioned with two or more packaged units.

In those production areas where two units are located, one is controlled by a thermostat only, and the other by both a thermostat and humidistat to provide finer humidity control. The system was designed so that the majority of the units could be installed without ductwork.

In two printing departments where humidity control is critical, provision has been made to add moisture during winter months through the use of spray nozzles and compressed air.

Aluminum ceiling insulation to minimize the sizable sun load reduced the building's air conditioning requirements by 50 tons. The insulation also improved lighting conditions and has reduced heating expenses about 40 percent.

The system was installed by Central Air Conditioning and Heating, Inc.

SAM LEWIS' PAGE

"Dear Mr. Shopping Center:"

SAMUEL R. LEWIS, consulting mechanical engineer and a member of HPAC's board of consulting and contributing editors, comments informally each month on practical heating, piping and air conditioning problems. This month, Sam Lewis' Page is in the form of a letter to the owner of a new shopping center from a consulting heating and air conditioning engineer.

THIS IS A RESUME of our interview of yesterday. I set it down for fear that you may forget it. Your problem, of course, will largely be settled by your architect. But since your architect and I are friends, I feel sure that he will appreciate the extra copy of this letter which I enclose.

Your project will be one story high, though you may possibly find it desirable at some future time to add at least another story. There will be fairly husky columns, spaced symmetrically on deep foundations. Their tops will be connected by trusses.

There will be required electric and water and waste services to a great many of the display cases. Yet the connections from the main conduits and pipes must be flexible, since no one can foretell the changes in the locations of the counters and cases.

Basement Is Needed

Experience in merchandising seems to indicate the advantages inherent in such flexibility. Merchants testify to the advertising benefits that follow rather frequent rearrangement. For these reasons I recommend, emphatically, a basement. We can extend the various service pipes, along the basement ceiling.

Incidentally, we have found no stores of this type that failed to find use for the basement, and none which, failing to provide a basement, did not ultimately regret its absence. In case after case, as the business extended, we found much of the basement used as selling space. With conduits and main pipes present and accessible, it was economically possible to make large parts of the basement space attractive to the customers.

Of course, we require spaces for boilers and refrigerating machinery and it is better to locate heavy, "live," vibrating apparatus on the ground rather than to support it on posts.

Riser Ducts To Be Out of Sight

If the air supply and exhaust ducts for heating and cooling and odor-removing are placed at the basement ceiling, there must be vertical extensions from them for the distribution of air to the main story.

Air supply and exhaust openings and grilles in the sides of vertical ducts are not things of beauty, and the air currents from supply ducts have a tendency to interfere with banners and signs and merchandise. Exhaust openings also tend to draw air through merchandise that is near them, leaving the inevitable dust and lint to soil the merchandise. I remember great display racks of women's dresses that were ruined by dust when the racks were located near a big air exhaust grille.

Such riser ducts naturally would be adjacent to columns or interior partitions. However, what is here one month may be somewhere else next month. Therefore, there will be no vertical ducts except the large main ones through a room made for the purpose.

Locate Ducts, Outlets Overhead

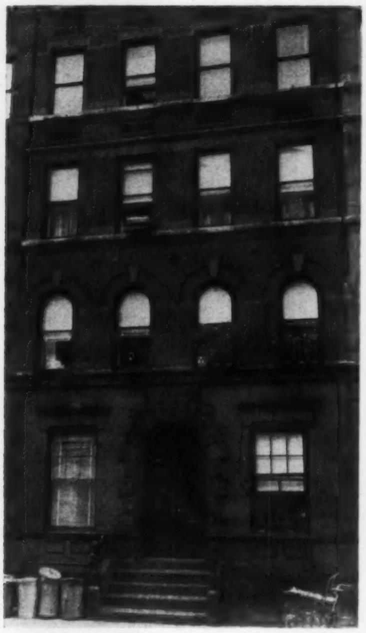
For these reasons I suggest that a definite overhead air duct space be designed through and between the trusses and beams that carry the roof. There will be, within this attic, the necessary room for both air supply and exhaust ducts and for all necessary branches and dampers for reaching at least the center of every construction bay in the store. The air supply openings as well as the air exhaust openings will all be in the ceiling.

We have proved that this arrangement works acceptably, with the air supply openings discharging horizontally or diagonally downward, and with the exhaust air rising vertically to openings in the ceiling near the supply openings. Whether the entering air shall be warmer than the general room air, as in winter, or cooler, as in summer, is not of consequence. And there will be minimum interference with displays and minimum deposit of dust. The ceiling openings are easily integrated with the electric lights by cooperation with you and the architects.

We will, of course, provide for recirculation of a large percentage of the air, along with the most effective filtering out of the dust, from both the recirculated air as well as from the air from out of doors.

Central Heating Installations Yield Profit in Fourth Year

. . . in existing "cold water flat" buildings



TYPICAL COLD WATER FLAT BUILDING in New York, 25 ft x 85 ft x six stories high, has no central heating system

By Norman C. Curtin

Consulting Fuels Engineer
Anthracite Information Bureau

CENTRAL HEATING PLANTS can now be installed in existing New York City apartment buildings at a profit to landlords in the fourth year of operation, as concluded in a study recently completed.Fuel costs, the study also shows, will take up only 30 percent of the rent increases which are permitted without tenant consent.

The study is given added significance by the fact that central heating may be made compulsory in the world's largest city. Recent tragedies from tenant operated portable heaters in cold water flats may eventually force compulsory central heating through a revision of the multiple housing laws.

The New York state commission on rents seems anxious to cooperate with building owners. Charles Abrams, New York state rent administrator, testified at a public hearing: ". . .We will increase rents for any landlord who improves his property, and we will give him all the necessary incentives to do so. In this we are not exceeding our powers but carrying out the purpose of the statute to curb 'disruptive practices and abnormal conditions which produce serious threats to the public health, safety and general welfare'."

Here's a Typical Example

The law specifically provides that landlords be reimbursed for improvements in facilities. How does this work?

By installing a typical steam radiator and piping schedule as in Table 1 and providing year 'round hot water, the landlord could increase his income $23 per month per family. In the case of the 10 family unit, gross rent income is thus increased $2760 per year, and for the 30 family unit, $8280. Of course, the cost of installing and operating the system must be deducted from these annual income increases.

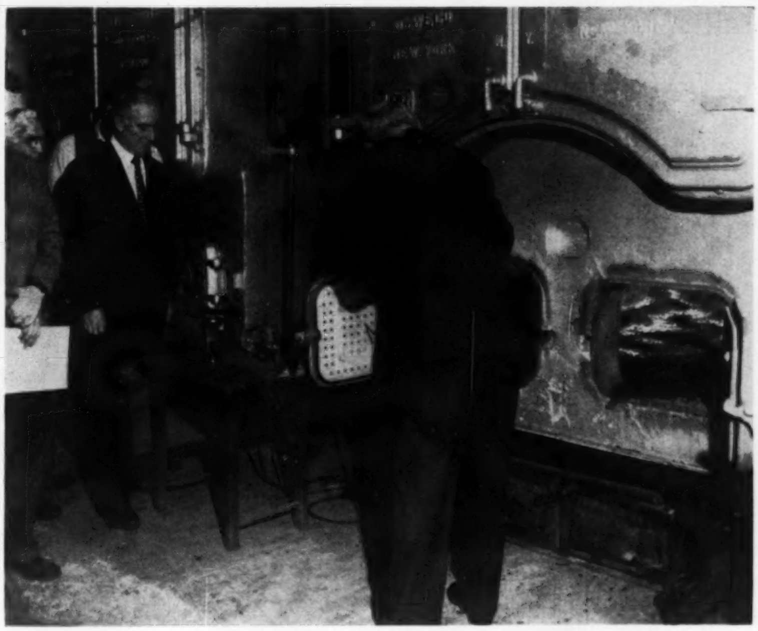
In order to get accurate data on the costs of installation, several contractors with long experience made estimates.

Contractors generally agree that the one pipe steam system offers a simple and low cost method. Selection of either a steel or cast iron boiler, they feel, would only slightly affect the total cost. Cast iron sectional boilers might have to be used in buildings with small openings. The lowest first cost installation is, of course, the hand fired boiler.

The costs as developed for various size multiple units, and shown in

TABLE 1—A TYPICAL STEAM HEATING SYSTEM providing the following and year 'round hot water would allow the landlord to increase his rent income $23 per month per family

	Radiator size, sq ft	Riser, sq ft, EDR	Total Radiation, EDR
Living room	45	5	50
Bed room		5	5
Bed room		5	5
Bath room		5	5
Dining room	35	5	40
Kitchen	25	5	30
TOTALS	105	30	135



SIMPLE INSTRUCTIONS to gain maximum results from hand firing are offered without charge to custodians of apartment and public buildings by the Anthracite Information Bureau at a New York City school

Table 2, range from $4475 for the 10 family unit to $10,750 for the 30 family unit. These estimates include:

1) Complete heating system, including boiler.

2) Complete hot water service system.

3) Chimney. Where adequate chimneys are available, this item — $525 to $700 — can be eliminated.

Each hand fired boiler is equipped with a pressure actuated damper regulator for automatically controlling drafts and maintaining uniform heat throughout the building. Additional automatic controls can be applied if desired.

Automatic Boilers Save Fuel

Using No. 1 buckwheat under natural draft, these boilers can provide clean, smokeless, economical operation, with firing attention necessary only twice in 24 hours in cold weather and once a day in mild.

The cost of fuel for heating and hot water, based on normal heat demand, and the current price of No. 1 buckwheat anthracite, is shown in Table 2, line 8. A 10 family unit heating and hot water supply system will cost $945 per year to operate. This leaves the landlord $1815 per year to apply toward other charges such as maintenance, repair and labor.

In automatic anthracite boilers using No. 3 buckwheat — barley — anthracite, coal is fed automatically from a storage hopper to an inclined water cooled grate. The grate is actuated by a simple cam arrangement. Ash is discharged automatically into specially designed containers in the base of the boiler. Not only is barley less expensive than No. 1 buckwheat, but one building engineer can take care of seven or eight buildings using automatic equipment.

Maintenance Cost Is Low

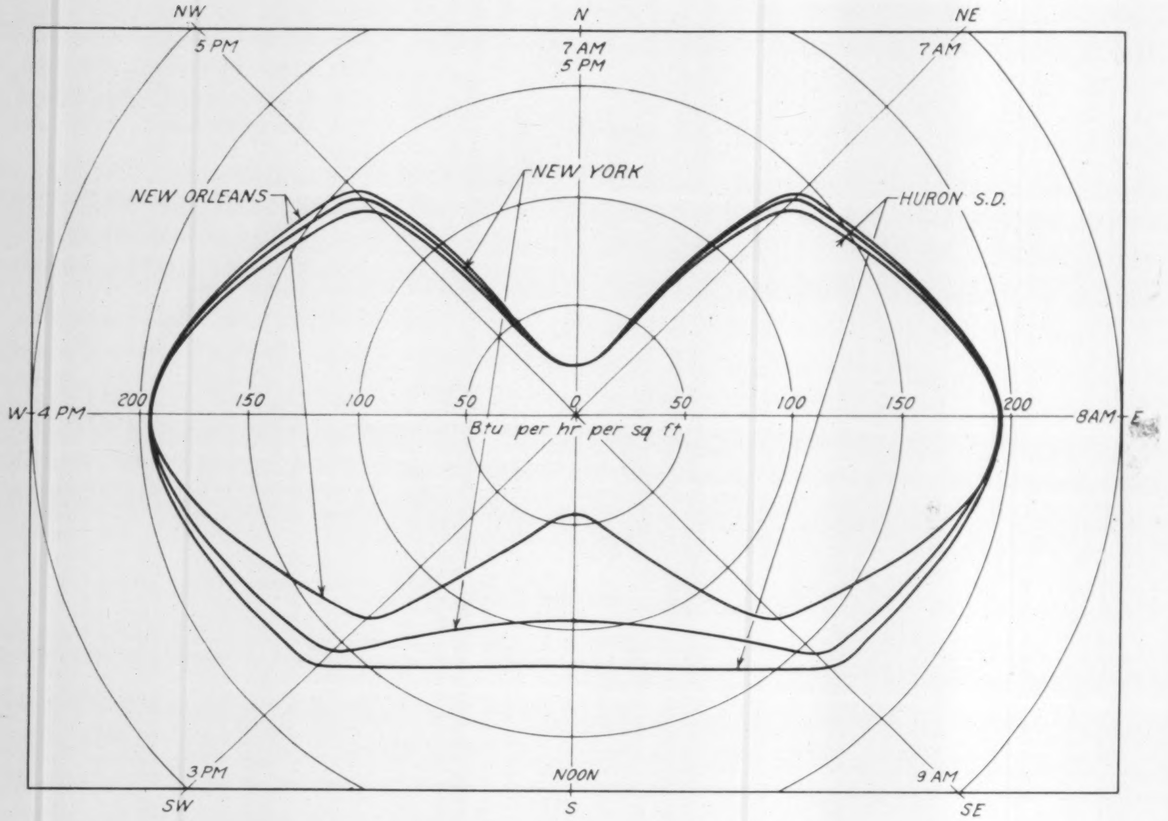
Maintenance and repair costs should be low. With proper care, boilers now available should last 20 to 30 years with very low maintenances. Replacement of smoke pipe and annual conditioning and check-up constitute the main cost items. A cost of $15 to $20 per year should adequately cover these.

Boiler attention and other duties such as cleaning are estimated at from $7.50 to $10 per week for a 10 family unit. In a 36 week heating season, the annual cost of such service would reduce the annual rent income left after fuel cost from $1815 to $1460 for a 10 family unit.

This means that sometime during the third heating season of operation, the system has been completely paid for out of increased income. The table also shows that in the 25 to 30 family units the system is paid for in less than three years.

TABLE 2—TOTAL COSTS estimated for a one pipe gravity steam system are given here for various size family units

Number of families in unit	10	15	18	22	25	30
1. Radiation	$2425	$3637	$4365	$5335	$ 6062	$ 7275
2. Basement hot water to existing tank	$ 225	$ 275	$ 325	$ 325	$ 325	$ 375
3. Upstairs crotons	$ 300	$ 400	$ 500	$ 700	$ 775	$ 850
4. Hand fired boiler	$1000	$1100	$1250	$1350	$ 1450	$ 1550
5. Stack	$ 525	$ 525	$ 525	$ 625	$ 700	$ 700
6. TOTAL (A)	$4475	$5937	$6965	$8335	$ 9312	$10750
7. Annual rent income increase $23.00/mo/family	$2760	$4140	$4968	$6072	$ 6900	$ 8280
8. Annual fuel cost (Heat and hot water)	$ 945	$1417	$1701	$2079	$ 2362	$ 2835
9. Annual gross toward amortization per year	$1815	$2723	$3267	$3993	$ 4538	$ 5445
10. Additional for boiler burner unit to use barley coal	$ 625	$ 625	$ 650	$ 750	$ 850	$ 1050
11. TOTAL system cost (B)	$5100	$6562	$7615	$9085	$10162	$11800
12. Rent increase	$2760	$4140	$4968	$6072	$ 6900	$ 8280
13. Fuel cost	$ 810	$1215	$1458	$1782	$ 2025	$ 2430
14. Gross toward amortization per year	$1950	$2925	$3510	$4290	$ 4875	$ 5850



1 MAXIMUM INSTANTANEOUS SOLAR HEAT GAIN on August 1 is shown here for New Orleans, New York and Huron, S.D., illustrating the effects of orientation and latitude

Weather's Effect on Air Conditioning Load

. . . varies according to the building and its location, and the season. Careful attention should be given to weather design factors, as well as internal heat gains, in the design of any system

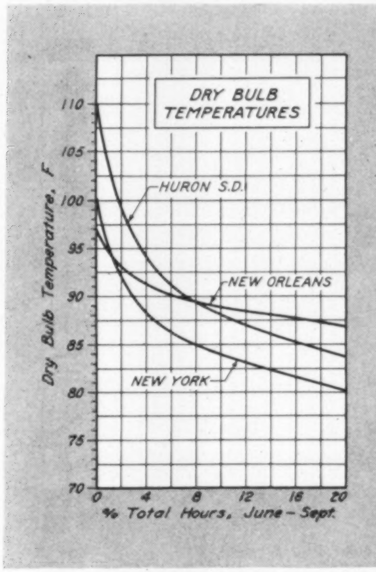
By John Everetts, Jr.,
Consulting Engineer
Charles S. Leopold

Weather design factors in air conditioning are important only in relation to the extent to which the air conditioned space is exposed to the weather. While the weather contributes about 80 to 90 percent of the load for residential air conditioning, it accounts for only 50 to 60 percent of the load for commercial air conditioning, such as office buildings, theaters and department stores. And the weather may contribute anywhere from zero to 100 percent of the load for an industrial plant or for special applications.

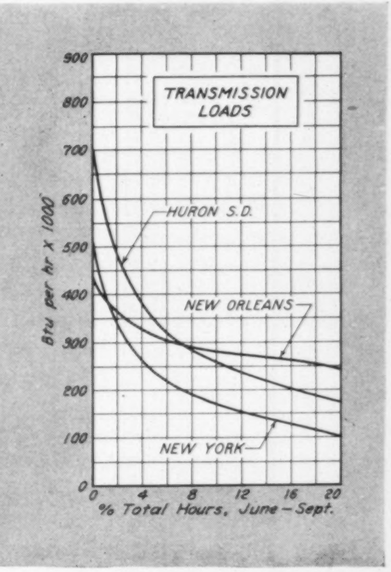
With this wide variation in weather design factors, it is important that effects of these variations be carefully considered in the design of any air conditioning system.

Air conditioning for comfort is designed primarily to

Of the five main heat producing factors, the three most variable are functions of the weather.



2 DRY BULB VARIATIONS on a 24 hour basis are shown here for the top 20 percent of the total hours of June through September



3 TRANSMISSION LOAD DIFFERENCES for a typical application, based upon the variation in total hours of an arbitrary cooling season, are shown here

minimize the discomforts surrounding man in an enclosed environment. These discomforts, caused by the weather and internal sources of heat, have five main sources which make up the cooling load requirements. These sources are as follows:

1) Dry bulb temperature of the atmosphere.
2) Heat radiated from the sun.
3) Wet bulb temperature of the atmosphere.
4) Heat and moisture liberated from people.
5) Heat from lights and other miscellaneous sources.

The first three are functions of the weather. The last two are internal sources and are usually constant.

The weather items are variable throughout the year, day and hour, and must be considered in their geographical relationship as well. The highly humid area around New Orleans, for example, is quite a contrast to the hot, dry conditions of Huron, S.D., and the medium conditions of New York, with its reasonably short hot weather season.

Let's look at the relationships of the various heat producing factors involved in an air conditioning load.

1. Effect of Dry Bulb Temperature

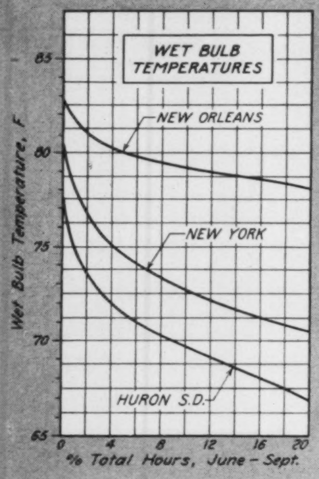
The dry bulb temperature differential causes heat to flow into a structure in which the temperature is at a lower level. This heat flow is called the transmission load or the heat gain. Thus, the importance of the DB temperature variation is proportional to the transmission load. The variation of the DB temperature in relation to the percent of the total hours from June through September is shown in Fig. 2.

The maximum temperature — zero percent of time — shows 110 F for Huron, 101 F for New York and 97 F for New Orleans. The trend of DB temperatures the rest of the time indicates the relative importance of this factor in air conditioning design. Eight percent of the time Huron and New Orleans have the same DB temperature of 89 F, while New York is 85 F. For 20 percent of the time, or more, New Orleans is 87 F, Huron 83.5 F, and New York 80 F.

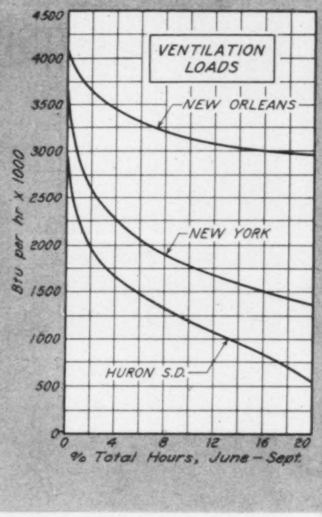
The transmission load for a typical application compared for the three cities, and based upon the variation in total hours of an arbitrary cooling season, is shown in Fig. 3. Huron, with a maximum transmission load of 710,000 Btu per hr, drops off 75 percent to 175,000 Btu per hr above 20 percent of the time. New Orleans drops from a high of 430,000 Btu per hr to only 245,000 Btu per hr, or a reduction of only 43 percent. New York shows a reduction of 520,000 Btu to 100,000 Btu, or a reduction of 81 percent. These values, of course, relate the importance of the transmission load to the total load, which varies with the type of building, and the application, as well as the zoning of the air conditioned areas. Design practice also affects this relation.

2. Effect of Solar Radiation

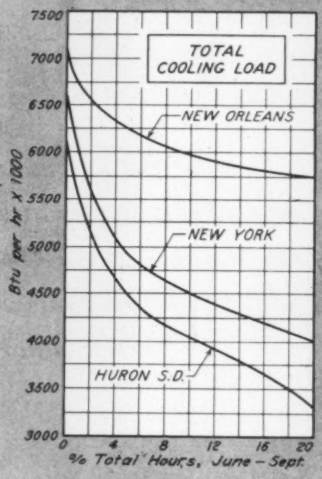
Solar radiation is transmitted through glass and through other parts of the structure by raising the surface temperature. The transmission through glass is so high compared to that through the structure that the structure load is usually neglected in calculating the total load. The maximum instantaneous solar heat gain through



4 WET BULB TEMPERATURE VARIATIONS for New Orleans, New York and Huron are shown here for the top 20 percent of the total hours of June through September



5 VENTILATION LOAD DIFFERENCES for the three cities are shown here in Btu per hr for the top 20 percent of total hours for June through September



6 VARIATIONS IN TOTAL LOADS, as affected by variations in DB and WB temperatures shown in Figs. 1 and 4, are shown here

single glass on August 1 is shown in Fig. 1. The solar loads for the west, northwest, north, northeast and east show little variation, while the values for the southeast, south and southwest range from 47 Btu on the south for New Orleans to 134 Btu on the south for Huron, or approximately three times the solar load on a south glass exposure.

While the solar heat gain is a small proportion of the total load in most cases, the full load is carried by only one zone at a time, east in the morning, south at noon and west in the afternoon. As the zones of a building extend only 15 to 20 ft in from the perimeter wall, then the solar load becomes an appreciable part of that particular zone load. Care should be taken in the selection of solar load values and also in the use of diversity factors applied to shading devices.

The intensity of the solar radiation will vary with atmospheric impurities, orientation and latitude. Values will be lower in industrial areas, where smoke and dust are more prevalent, than in areas where the air is relatively clean. The effects of orientation and latitude are also illustrated in Fig. 1. The greatest loads are on the east in the morning and the west in the afternoon. The south load varies considerably with latitude. Solar radiation on the north will rise rapidly, with a small shift to the northeast or northwest. The diffuse sky radiation, in addition to the instantaneous solar radiation, is also important and applies with equal intensity to any orientation in view of the sky.

The effect of shading devices should be given careful consideration. Venetian blinds are seldom fully drawn, except to block direct sunlight reaching individuals.

Solar heat gain values may be in terms of direct heat flow or as an equivalent temperature difference related to various types of construction of walls and roofs.

3. Effect of Occupancy Load

So long as the ambient air temperature and room surfaces are maintained below body temperature, and the relative humidity is below 100 percent, a person will release heat by radiation and convection and moisture by evaporation. Moisture loss by perspiration occurs when a person is subjected to a temperature and relative humidity above that required for optimum comfort. Assuming a maintained temperature of 75 F and a relative humidity of 50 percent, each person will release approximately 250 Btu per hr of sensible heat by radiation and convection and 150 Btu per hr of latent heat by evaporation.

Based upon a fixed occupancy, this load becomes constant and does not vary with the weather conditions or geographical location.

4. Effect of Lighting Load

Lights release heat by radiation, convection and conduction which is equal to 3415 Btu per kwhr. A large part of this heat loss is by radiation which goes into storage but which is later released by convection to the air. Therefore, the full value of the lighting load should be applied to the air conditioning load except in special cases where the lights are recessed in specially ventilated plenums.

Caution should be used in applying diversity factors to the lighting load around the building perimeter, where

"A small increase in WB temperature can overload the system."

solar heat gain through glass also applies. Experience has shown that lights are kept on even when the sun is shining, in which case the shading devices are partly drawn.

5. Effect of Wet Bulb Temperature

The WB temperature of the atmosphere imposes the greatest single load and the greatest load variation on an air conditioning system. This is especially true when the ventilation load is comprised of all outside air. It is an instantaneous load with no diversity or storage.

The WB temperature variations for New Orleans, New York and Huron, and their variations for the top 20 percent of the total hours of June through September, are shown in Fig. 4. The curves for New York and Huron have about the same slope but at different levels, while the New Orleans curve tends to level off quite rapidly, resulting in a relatively high WB temperature extending over a long period of time.

Applying the WB temperature to the ventilation load, a series of curves results as shown in Fig. 5. Again, New Orleans is the highest, with New York and Huron following, as in Fig. 4, but with one important difference: the order of magnitude of the variations of temperature with the variation in load.

The WB temperature is an index of the total heat in a water vapor-air mixture. The total heat increases with an increase in WB and it decreases with a decrease in WB temperature. Comparing the percentage reduction in WB temperature from zero percent to 20 percent of the top total hours with the percentage reduction in load shows: New Orleans: 24.5 percent reduction in temperature, 28.0 percent reduction in load. New York: 56 percent reduction in temperature, 62 percent reduction in load. Huron, S.D.: 70 percent reduction in temperature, 82 percent reduction in load. Thus, the reduction in load is at a greater rate than the reduction in temperature.

Total Load for Office Building Calculated

The total load shown in Table 1 representing that of an office building has been calculated for the outside DB and WB design conditions indicated and corresponding to conditions which are exceeded only 5 percent of the total hours for June through September. These conditions are used only to illustrate the comparative values of the load components and are not necessarily the optimum design criteria. The optimum design criteria must be left to the judgment of the engineer.

TABLE 1—TOTAL AIR CONDITIONING LOAD in **Btu per hr, for an office building is calculated here for the outside DB and WB design conditions indicated and corresponding to conditions which are exceeded only 5 percent of the total hours for June through September**

Load	New York	New Orleans	Huron, S.D.
Transmission	240,000	320,000	350,000
Solar radiation	370,000	340,000	400,000
People	700,000	700,000	700,000
Lights	1,500,000	1,500,000	1,500,000
Ventilation	2,170,000	3,380,000	1,560,000
TOTAL	4,980,000	6,240,000	4,500,000
Design DB;WB, F	87;74.4	90.6;80	92.5;71.3

For example, the transmission loads for New York and News Orleans are only 5 percent and for Huron but 8 percent of the total loads. Therefore, any increase in DB temperature, up to zero percent of total time, as shown in Fig. 1, would result in only a small change in the total load.

The solar radiation values are 7½ percent, 5½ percent, and 9 percent, respectively, of the total loads for New York, New Orleans and Huron. As the solar radiation design values closely approach the maximum values, and as the duration of maximum intensity is so short, there is little danger of any increase in total load from this source.

The total loads from people and lights are 44 percent, 35 percent and 49 percent of the total loads, respectively, for New York, New Orleans and Huron. As these loads are fixed and constant, no increase in total load is contemplated from these two sources.

The ventilation loads are 43 percent, 54 percent and 35 percent of the total loads, respectively, for New York, New Orleans and Huron. Because of its magnitude, a small increase in WB temperature can seriously overload the system and result in discomfort to the occupants.

The variation in total load is shown in Fig. 6 as it would be affected by the variation in DB and WB temperature, as shown in Figs. 2 and 4. If 5 percent of the total hours are taken as a design value to calculate the total loads shown in Table 2, then the percent increase to the maximum load to be expected approaching zero percent time would be 35 percent for Huron, 31 percent for New York and only 12 percent for New Orleans. This means that the design WB temperature cannot be arbitrarily set at the same percentage of total hours for all localities if the engineer wishes to limit the magnitude of overload and degree of discomfort in a given application. The same applies to the DB but to a lesser extent in most applications.

For example, if the 12 percent overload for New Orleans were used as a design basis for New York and Huron, then the percent of total hours would be 2½ percent for both New York and Huron, instead of the 5 percent used for New Orleans. This would mean a design DB and WB of 91 and 76.2 F for New York and 97.5 and 73 F for Huron, instead of the 87 and 74.4 F and 92.5 and 71.3 F used in Table 2 and corresponding to the 5 percent values.

This article was originally presented as a paper at the annual meeting of The American Society of Mechanical Engineers.

Slab on Grade Schools Heated by Warm Air Panels and Convection

By Fred S. Dubin
Fred S. Dubin Associates
Consulting Engineers

THE IDEAL heating and ventilating system must supply heating and cooling and also complete comfort. In addition, for schools the system should take the following into account, as desirable features:

1) Adequate temperature control.

2) Humidity control.

3) Air filtration: freedom from dust and pollen.

4) Outdoor air and ventilation.

5) Odor control.

6) Uniform temperatures from floors to ceilings, with warm floors especially important to kindergarten and lower elementary grades.

7) Uniform temperatures from outside walls to room interiors.

8) Germicidal treatment of the air.

9) Quiet operation.

As the initial cost of the system in most schools must, of necessity, be tailored to fit "tight" budgets, so also operating and maintenance costs must be as low as possible. Therefore, simplicity of operation is an important factor.

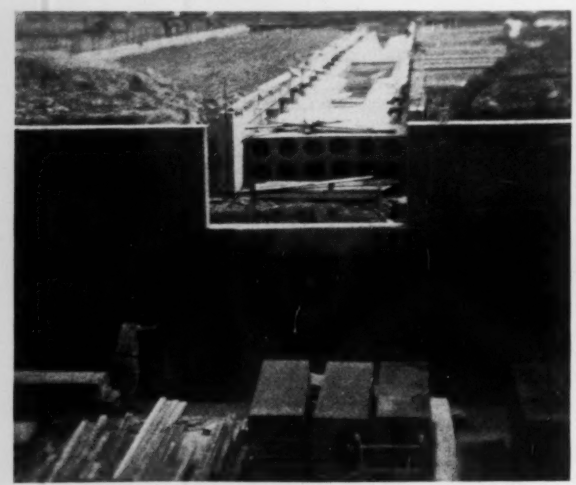
Ideally, too, the heating and ventilating system should be integrated with the building structure to effect any possible reduction in the general building costs. Also, it is desirable to have the system concealed from view as far as possible, and consume a minimum of space.

Variations of warm air heating or warm air panel heating possess features meeting these qualifications.

School authorities in Connecticut had to be convinced that warm air heating should be used. Complete plans and specifications for a warm air panel heating system for a particular school were presented, and after several conferences between the engineer, architect and state board of education authorities it was decided to install a modern forced warm air panel heating system in a new elementary school. Since then, the system has been installed in several schools, ranging in area from 8000 sq ft to 64,000 sq ft.

Warm Air and Slabs Heat Rooms

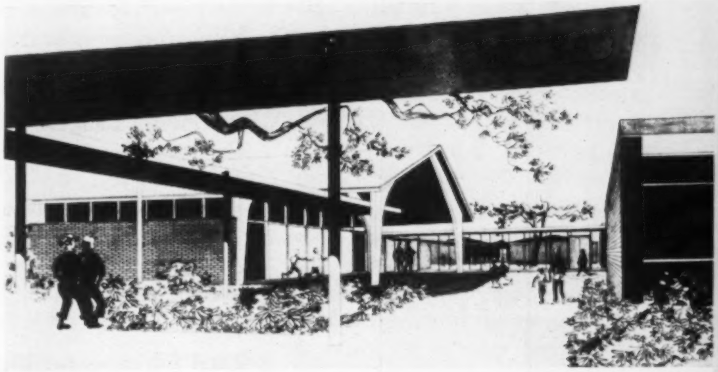
All of the schools are one story slab-on-grade construction. In each,



1 CONCRETE TRENCH under central corridor houses supply duct to each classroom and serves as return air duct. Furnace room in foreground is below grade

2 PERIMETER DIFFUSERS and ducts are installed immediately after footings are ready. In some schools, hollow cores of concrete beams are used as ducts

. . . One story, slab on grade buildings utilize two or more warm air furnaces to warm slabs and to heat and ventilate classrooms and other spaces by convection from perimeter outlets.



two or more direct fired oil burning furnaces are installed. Warm air is blown through non-ferrous ducts embedded in the floor slab. The slabs are warmed to a temperature of 70 to 74 F. The warm air is ultimately discharged directly into each room — at 70 to 120 F, depending on the weather — along the outside glass walls, either through a continuous grille at counter height behind the wall cases, or through special baseboard registers. Vertical velocities are about 200 fpm, enough to counteract downdrafts.

Vary Amounts of Outdoor Air

The blowers in the furnace operate continuously during periods of occupancy to supply outdoor air, ventilation, and prevent stratification of temperatures in the rooms. Total air change in each room occurs every six minutes.

Outdoor air is introduced evenly to all areas during the daytime in varying amounts, depending on outdoor temperatures, from 10 cfm per pupil when it is 10 F outdoors, to 40 cfm per pupil when it is 60 F outdoors. At night and over weekends, the outdoor air is cut off and all the air is recirculated, the blowers operating intermittently and at reduced speed.

The recirculated air is carried back from each classroom to the central furnace unit, through either a tunnel under the corridor or a plenum space over the ceiling of the corridor. In later installations, it has proved more economical to use the space below the corridor because the same trench is utilized to carry the individual supply feeder ducts to each classroom.

The concrete trench itself forms the return duct. In general, there is an individual supply duct for each classroom passing under the central corridor. At each classroom, four feeder ducts branch off from the main feeder duct and extend to the outside wall, where the air is discharged into the room.

Supply Ducts Not All the Same

In one school, the ducts in the floor are prefabricated round fiber tubes that resist moisture and corrosion and that have been treated for fire resistance. In another school, con-

3 ELBOW DUCTS connect main supply ducts set in vermiculite concrete with smaller ducts, which are eventually embedded in slabs

4 SPACE ABOVE DUCTS in trench forms passage for air to return to furnace. In one campus style plan, no trench was used crete floor beams with hollow cores from the corridor to the outside walls are utilized as ducts. The corridor trench, which carries the warm air, is divided into nine sections by vertical panels parallel to the length of the corridor. The panels form smooth air passages.

In the trench of another school, 15 in. round fiber ducts to each classroom are insulated with 2 in. vermiculite concrete between them.

Sufficient space is left above the ducts in the trench to permit its use as a return air duct.

In one campus style plan, no trench was used at all. Return and supply air is carried in ducts under the floor.

Individual Room Control

Each classroom, the gymnasium, and administrative areas have individual room thermostats for individual temperature control. Temperature control is accomplished by manipulation of dampers in the furnace room only, which vary the temperature of air delivered to each room. The total quantity of air delivered to each room is always constant, so that ventilation and air movement is kept at optimum condition at all times.

The furnace blower is removed from the furnace during installation and bypass ducts are arranged to connect the blower and warm air bonnet. An individual bypass duct connects an individual warm air duct at each furnace.

Upon a demand for increased temperature in any classroom, the room thermostat operates a motor which positions dampers in the bypass duct and bonnet duct for the classroom so that less bypass air and more warm air from the bonnet is delivered. Each classroom thermostat operates its own set of dampers.

Room air is exhausted through wardrobe closets and gravity roof ventilators equal to the amount of outdoor air introduced into the room.

Dual Furnaces for Flexibility

Each furnace is equipped with an automatic humidifier with controls. A glycol dispenser introduces glycol vapor into the suction side of each furnace blower so that the airborne bacteria count is reduced in the entire building. In addition, all outdoor air and recirculated air is filtered at the intake for each furnace blower.

Two furnaces in several of the schools provide flexibility and economy of operation. The furnaces, which normally supply different sections of the building, are cross connected so that either unit can serve the entire building in an emergency.

In one campus type school, each building has a separate heating plant. Preliminary figures indicate that over $15,000 will be saved by using four separate heating plants instead of one central plant. Bids have since been received and contracts let. The savings were $18,200. Also, fuel costs have been 15 to 35 percent lower.

Furnaces in some of the schools burn No. 2 fuel oil, but others burn cold No. 5 oil, without preheating.

Induced draft fans are used in all schools to assure consistent constant combustion and architectural freedom of design.

Controls in all but the smallest schools are pneumatic.

Here's What It Costs

Our experience indicates that warm air panel heating can be installed for an initial cost between $1.10 and $1.60 per sq ft, depending on the extent of the controls, the type of fuel, the warmth of the floors desired, and the number of furnaces employed. In each of the schools, the furnace is in a basement below the first floor level, with the rest of the building on grade.

However, it is possible to install the furnace in a room on the first floor level.

Subsequent jobs have been designed with furnace rooms on the main floor. In some cases, it has been possible to limit the furnace room height to 8 ft.

Heat Exchanger Saves Fuel

One feature which we are designing for all warm air heated schools now is a heat exchanger whereby the air which is exhausted from classrooms, gymnasiums, and auditoriums preheats the incoming ventilation air, resulting in a considerable fuel savings.

The heat exchanger is fabricated of metal and is easily adapted to all installations.

Packaged Heat Pumps Condition Office Building

. . . largest installation of its kind

THE WORLD's largest office building completely air conditioned by packaged heat pumps has been opened in Decatur, Ala., according to the General Electric Co. All six stories and the basement of the Mutual Savings Life Insurance Co. are heated and cooled by 13 5 ton air to air heat pumps.

Using only electricity, the units extract heat from the outdoor air in cold weather and pump it indoors to warm the building. In summer, they extract heat from indoors and dispose of it to the outdoor air.

Because there are more than one tenant on the first floor, three units were installed to condition this area and the basement, using two zones for the first floor and one for the basement. Ducts return air from the first floor to the basement units. Air from the other floors returns through doors and hallways. On these upper floors, units are installed with a thermostat control that permits one unit to shut off entirely if only one is needed. Each floor except the first has a single zone system and is served by a large supply duct running the length of the building. This duct is covered with acoustical tile to match the ceiling.

THE LAW AND YOUR PROFITS

By William Hurd Hillyer

Setting Up an Air Conditioning Equipment Leasing Program

ANYTHING that makes the purchase of air conditioning systems financially more comfortable for the buyers has a bearing on the potential profits of engineers and contractors in the field. One program with a good potential for increasing sales of packaged unit installations is the so-called equipment leasing plan.

Like many other financial plans, equipment leasing has time honored roots. Railroads have leased freight cars for over 50 years, and fleets of trucks and cars are leased annually by many companies. Now, industrial and commercial firms lease equipment and fixtures of many kinds, including air conditioning equipment. The title to the equipment remains with the lessor, and all payments are in the nature of rentals. The cost, therefore, may be classed by the lessee as deductible expense for income tax purposes.

The air conditioning contractor does not have to tie up his funds in equipment to be leased to clients. There are leasing companies whose sole business it is to purchase all kinds of industrial and other equipment, and lease it to users. The contractor receives his money in full upon completing an installation. Yet the client has no investment tied up either, and he gets the benefit of a favorable tax situation.

How To Set Up Program

The mechanics of setting up a leasing program are relatively simple. The standard procedure advised by one national leasing firm is substantially as follows:

1) Submit to lessor corporation the name, address and credit data of proposed lessee. This information should include Dun & Bradstreet rating, current financial statement, and bank reference.

2) Submit for approval a description of equipment and approximate cost and request that a detailed proposal be sent to prospective lessee by lessor.

The lessee should give the air conditioning contractor a letter or purchase order directed to the lessor specifying the equipment and the price agreed upon between him and the contractor, as well as the acceptable lease terms. When the equipment has been delivered by the contractor and accepted by the purchaser upon schedule, the leasing company will honor the contractor's invoice or the supplier's.

Much depends upon the financial standing of the proposed lessee. Hence, rental charges — which may be paid monthly, quarterly, semi-annually or annually — are figured according to commercial rating. Since many of the real estate and other corporations that would qualify for air conditioning equipment do not possess a regular commercial rating, the rating in such cases may generally be adjusted on a basis of net worth.

Advantages of Leasing

Among the advantages pointed out for lease financing are:

1) Addition of new equipment at any time without freezing working capital.

2) Improved balance sheet position, as the cost does not appear as a liability.

3) Use of new equipment on lease payment as tax deductible expense.

4) Modernization or replacement of obsolete equipment on a pay-its-way basis.

5) Substantial improvements without changing capital structure.

6) Equipment costs pinpointed to specific contracts — important to the air conditioning contractor.

Insurance, maintenance and property or sales taxes are paid by the lessee and are "normal, tax deductible continuing expenses." A purchase option will be included by some lessors upon request, but most of them advise against it, since it may cause tax complications. In setting up a leasing arrangement, care should be taken that only such equipment units be included as may not be considered part of the real estate.

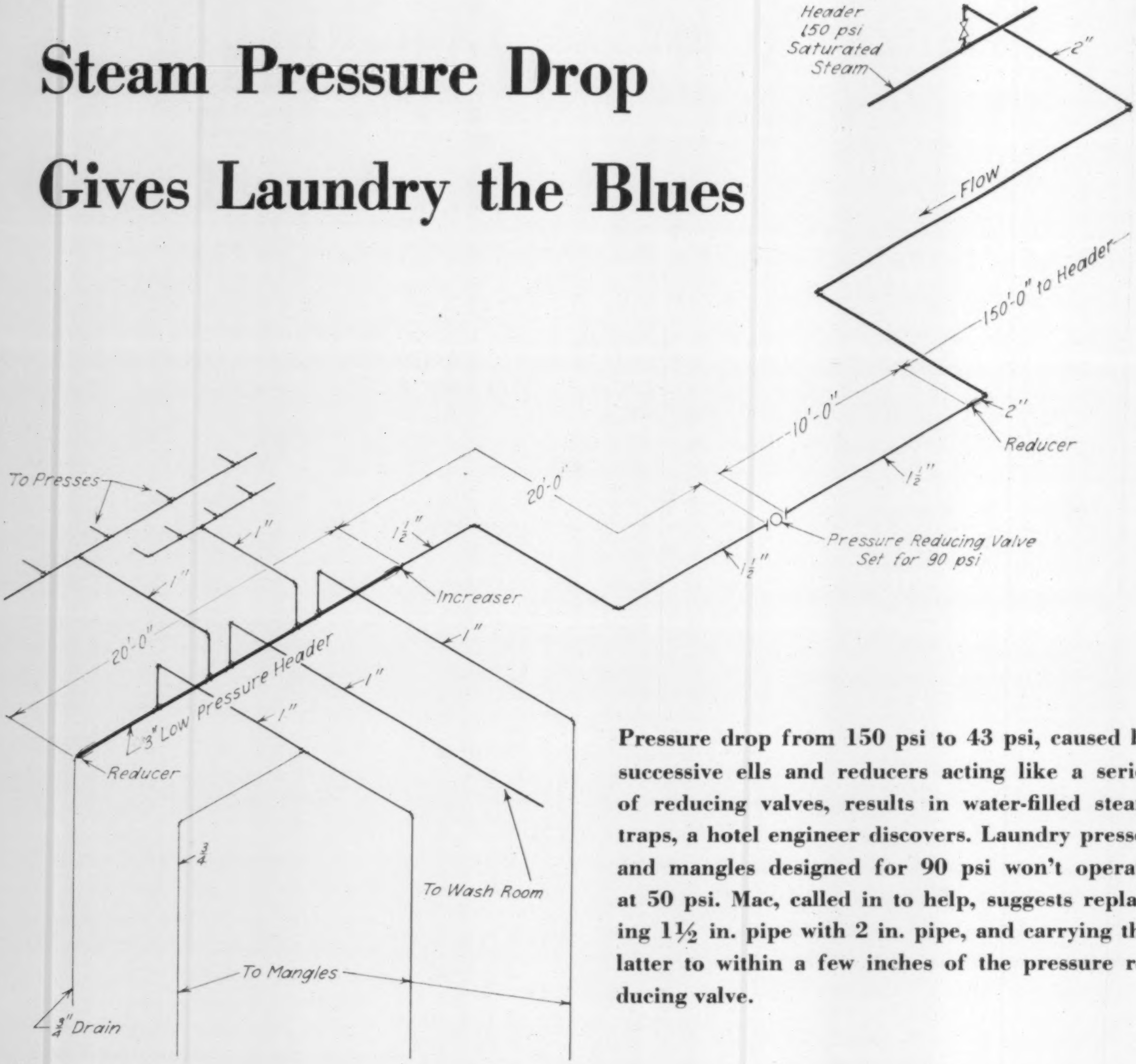
[Note: It should be remembered that legal rules vary in different states.]

WILLIAM HURD HILLYER, author of this regular feature, is a contributor to a number of banking and financial publications and has written several books on business. A former vice president of the Atlanta Trust Co., his work there gave him a practical legal background.

PRACTICAL PIPING PROBLEMS

By Bill Dopp

Steam Pressure Drop Gives Laundry the Blues


Header
150 psi
Saturated
Steam
2"
Flow
150'-0" to Header
10'-0"
2"
Reducer
1½"
Pressure Reducing Valve
Set for 90 psi
1½"
20'-0"
1½"
Increaser
To Presses
1"
1"
1"
20'-0"
3" Low Pressure Header
1"
1"
Reducer
¾
To Wash Room
To Mangles
¾" Drain

Pressure drop from 150 psi to 43 psi, caused by successive ells and reducers acting like a series of reducing valves, results in water-filled steam traps, a hotel engineer discovers. Laundry presses and mangles designed for 90 psi won't operate at 50 psi. Mac, called in to help, suggests replacing 1½ in. pipe with 2 in. pipe, and carrying the latter to within a few inches of the pressure reducing valve.

MARTIN MACVANE was enjoying the luxury of a deep overstuffed chair in the lobby of the Metropole hotel, waiting for the rain to stop.

"Hi, Mac," said a tall Lincolnesque character. "Some rain. Why, I haven't seen you for ages. How are you, anyway?" He pulled up a chair and sat down.

"Fine, fine," Mac answered without enthusiasm. "I'm hoping to get home without having to swim." He glanced toward the windows. "Doing anything for yourself, Len?" the gasket salesman asked.

Leonard Baxter shrugged. "Just so-so, Mac. Being engineer for this pile of brick is no cinch. There doesn't seem to be an hour that something fails to break down. Or we get a leaky pipe or a broken valve."

Mac said, "To hear you operating fellows talk, one would think that no one else ever had any troubles. Don't take life so seriously."

Bill Dopp has had some 40 years of experience dealing with piping, including a long stretch as a sales engineer. He is devoting part of his present leisure to writing of his many piping experiences. All the names used are fictitious.

"Listen," said Len. "Right now I've got a wild laundryman downstairs yelling like a banshee. I rearranged his laundry, re-piped most of the outfit and got him all fixed up slick. Now he accuses me of trying to get his job. It's all because a couple of steam traps aren't working just right."

"Important traps?" Mac asked.

"Just the traps on the big mangles. They were all right a week ago, but now something has happened to them. Dirt, I suppose. Anyway, Castro is raising all kinds of a row. Says he can't get his mangles hot."

Len's eyes brightened. "Mac," he said, "come on down and see if you can tell what's the matter."

The rain was still whipping the big windows furiously. Mac pulled himself loose from the deep chair. "Okay, Len. Let's go. Might as well be doing something useful."

"Let's Look at the Traps"

They took the elevator in the service alley down to the basement. In the steamy dankness of the washroom they threaded their way through a maze of trucks full of wet towels, sheets and sacks of dirty laundry to the finishing room.

It was a big room full of machinery. The room had a peculiar soggy, soapy smell. Presses popped. Pads slammed. Hot rollers hissed as they touched the wet cloth.

"Lots of work," said Mac to Len.

As they came near the big steaming mangles, a small, stocky man in overalls rushed toward them. His black eyes flashed.

"What you going to do?" he said, waving at Len. "I'm gonna quit if you don't do something!"

He grabbed a sheet from the folding board. "Look. Like a plank. Stiff and slick. You like to sleep on that?" He shoved the cloth under Mac's nose.

"The housekeeper is going to tear out my hair. The barber's mad and the head waiter is yak-yak all the time on the telephone." The little man spread his hands and said, "Please, Mr. Len. What you gonna do?"

The situation was anything but funny, yet Mac had to struggle to keep a straight face. "Let's take a look at those traps," he said to Len.

At the other end of the mangle, Mac stooped down, touching the trap gingerly. He listened intently, then rose, looking for a stick. A young woman stood close by, watching them. She handed Mac the smooth stick she was holding.

"This is Martin MacVane, Kate," Len said. "Mac, our forelady, Kate Morgan."

Nodding, Mac put one end of the stick against the trap. The other end he held to his ear. Motioning to Len to take the stick, he said, "That trap is wide open. Those cylinders are half full of water."

Len listened to the stick for a minute. "How can that be?" he exclaimed. "We never had that trouble before."

Tony Castro came up just then. Kate said, "We'll have to stop work again, Mr. Castro, until these mangles get hot again." She turned to Len, "You must do something, Mr. Baxter, we are way behind now, and the linens aren't fit to use after we get them through the mangles."

Piping Was Changed

"When did the trouble start?" asked Mac.

"Yesterday morning," she said. "They rearranged the whole laundry over the week-end. We added four presses and that small mangle over there. Now everything is wrong." She pointed to the stack on the table. "Look at those sheets. I'm ashamed of them."

Tony glared at Len. "Don't say it, Tony," said Len. "We'll fix things pretty quick. I've got an expert here who'll find the trouble in no time."

"What did you do to the piping?" asked Mac.

Len pointed to the bare piping near the ceiling. "We had to change the main line to take care of the new equipment. It used to be over here but we ran it down along that line of columns instead. We'll cover it next week-end."

"Anybody lay out the piping arrangement?" Mac asked.

"Gosh, no," laughed Len. "It's just a simple bit of piping. We talked over where we were going to put it, and they went ahead." Then he asked soberly, "Why — what's the matter?"

"Just a simple bit of piping," said Mac. "Len, don't you know there isn't any such thing? What's your boiler pressure? What do you want on those mangles?"

What Are the Design Pressures?

"The boilers carry 150 psi," began the engineer, frowning. "The mangles are supposed to have 90 lb. Why the gloomy look?"

"You fellows have really messed things up," said Mac. "Where are the boilers?"

"Over at the other end of the hotel," said Len tartly.

"How far away?"

"Well —it's about 150 ft from that turn there to the boilers, I'd guess."

"Any more elbows in the line?" Mac asked, eyeing the one he could see.

"Four."

"That's 2 in. pipe," Mac declared. "There's a reducer to 1½ in. pipe a couple of feet from the ell and another 10 ft of 1½ in. pipe to the reducing valve. Then there's about 20 ft of 1½ in. pipe and a couple of ells to the point where you increase the size to 3 in. Some layout," he said with disapproval.

The engineer was silent. Mac gazed across the room to where Kate and Tony were arguing heatedly. Finally Mac turned back to the problem. He laughed at the forlorn look on the engineer's face. "All right, old top," he said, "Let's see if we can get this straightened out. Do you have a gage that we can put on the steam pipe to the mangles?"

"Tell Me What's Wrong"

"I think so. I'll have to look," Len said, as he glanced up at the piping. "Will you please tell me what's wrong?"

"Did anybody readjust that reducing valve?" Mac asked.

"... That's six pressure reductions—just like six reducing valves, one behind the other. You don't have 50 lb. on those mangles."

"I don't know," Len said, shaking his head. "I'm sure I didn't."

"Look here," said Mac. "You've got a pressure drop from the boilers to that first reducer over there. Then you take the same amount of steam and jam it through 10 ft of 1½ in. pipe. That is some more pressure drop. I suppose that valve is set to reduce to 90 psi." Len nodded.

Mac continued, "That's another pressure drop. On top of that, there is a reduction of the pressure on the low side of the valve as you increase the use of steam. So far, it's bad enough. Then you add about 20 ft more of 1½ in. pipe and a couple of ells, to the point where you increase the size to 3 in. at the pressure header." He counted on his fingers. "That's six pressure reductions . . . . just like six reducing valves, one behind the other. I'll bet you don't have 50 lb on those mangles."

Test Pressure on Mangles

"I'll get the gage," Len called as he hurried away. Mac strolled over to where Kate was sorting out the best of the finished sheets.

"You can stop worrying, Miss Morgan," said Mac. "We'll get things right in a little while. Just have a bit of patience."

"It's a terrible muddle," she said. "A lot of this work will have to be run through the washers again, and the boys in there don't want to do it. Everybody is mad at everybody. What's wrong, anyway?"

"It's just that nobody thought this thing through before they made a lot of changes. Taking things for granted can get you into a lot of trouble," Mac said.

Len came up with a gage and some tools and a mechanic. They went to the steam end of the mangle where Mac quickly planned how to attach the gage. He walked around the room while they did the work.

When he returned, they had finished and the gage stood at 52 psi. Len pointed at the dial. "Close guess," he said. Mac said nothing but walked back to Kate.

"Will you run some sheets and towels through now?" he asked.

"You bet," she replied eagerly.

"They won't be much better at first," he declared, "but they'll soon improve, I'm sure."

The steam rose quickly from the rolls. Mac watched the gage begin to drop, until it fell to 43 psi. Len had a puzzled look on his rugged face. "Holy mackerel!" he exclaimed, "No wonder they can't get any work out of those mangles."

He glanced sharply at Mac, who was thumbing through a little black book he had taken from his pocket. "Wait a minute," barked Len, "What made that pressure go down?"

Adjust Reducing Valve

Mac laughed. "You just put that series of reducing valves into action when you began to condense what little steam there was in that cylinder. Notice, you're down to 40 now." He found the information he wanted. "At 90 psi, which you are supposed to have on the cylinder, you would have a temperature of 331 F. At 40 psi you actually have only 287 F, or a difference of 44 F. But the water in the cylinder is probably down to 260 F." He chuckled. "That's what's the matter with your mangles."

Len asked, "Do you think we'll have to pull down all that pipe?"

"Let's try an experiment first," said Mac. "Get a ladder. Maybe we can adjust that reducing valve to improve this situation." He sniffed at the rancid steam coming from the mangle.

Just then Kate came up and said, "The rolls are getting wet again. It's no better than it was." Casting a suspicious glance, she went back.

Len was on top of the ladder. "Turn that adjusting screw down very slowly," Mac warned, "but keep going. I'll keep track of the gage."

He walked back to the mangle. Slowly, the pressure began to rise. Mac signalled to Len to keep going. The needle crawled up to 60, then 65, finally coming to rest at 72 psi.

Mac waved for more steam, but Len came down from his perch. "Down as far as it will go, Mac," he said. "How does it stand?" He looked at the gage. "That's fine but. . . . ." His thought trailed off. "That's not enough," he said.

Mac looked across the mangle to Kate, who was now smiling. "It's getting hotter," she called.

Walking around to her, Mac said, "Don't crowd it too much. It isn't right yet, but I'm sure you can get your work out if you take it a little easy."

He put his hand on the drying padded roll. "If these rolls begin to get wet again, just give them a few minutes rest."

"Thanks a lot," she beamed.

"What now?" Len asked when Mac returned.

Re-Locate Valve, Change Pipe

"Well," Mac replied thoughtfully, "looking over what you've got, I'd say that the easiest way out would be to take that reducing valve out from where it is, and place it at the end of the 1½ in. pipe next to the 3 in. header."

"We could put a union where the valve is now," said Len. "By moving that 1½ in. pipe over a little, we would have room to put the reducing valve into the same size gap at the header." He brightened at the idea.

Mac looked the line over again. "I don't know," he mused. "You still have the pressure drop through the 1½ in. pipe. It won't be quite as bad since there will be no low pressure steam in that line. Volume makes a big difference when it comes to pressure drop."

"You think we ought to change the pipe, don't you?" Len asked.

"If it were mine, I'd certainly take out that 1½ in. pipe altogether," Mac said.

"That would mean putting in a 2 in. reducing valve, too," said Len.

"No," said Mac, "I think that valve's all right. Give it a chance, and it will deliver all the steam you need. Carry the 2 in. pipe up to within a few inches of the valve, and put a very short nipple on the outlet side. Then set your valve by the gage on the mangle to get the pressure you need. I'll gamble that those things will get so hot you will have to cut down on the pressure."

"We'll go to work pronto next week-end to get that fixed," said Len. "I owe you a lot, Mac. I was in a worse jam than I had any idea of. Thanks, many times."

"Still in a Jam"

"You're still in a jam," Mac cautioned. "Or you will be, the first time anything goes wrong with that reducing valve."

"What do you mean?" Len asked sharply.

"It's nice to rely completely on the merits of a dead end valve," said Mac. "But if an insurance inspector caught you without a relief valve on that low pressure header, my friend, would be in trouble."

"That's not all," Mac prodded. "You are trying to drain that 3 in. header through a reducer on the end of the line. That line is about one-third full of water. I've noticed it jar several times when one of the presses opens. Some day three or four of the press valves will open at exactly the same time."

"Then what?" asked Len.

"Then water hammer is going to take that line right out of those flimsy hangers. Somebody could be killed."

Len whistled. "I am in deeper than I thought." He shook his head. "I've been a fool. I thought I could leave that piping to someone else and not bother with such a simple thing."

"I told you before, Len. There's no such thing as simple piping. And you're playing with 150 psi steam."

"Mac, I promise you, I'll straighten this out at once," Len said.

"And don't go blaming a couple of poor helpless steam traps for all your troubles," chided Mac.

"Don't rub it in, please," said Len. "Let's go wash up. I'm going to buy the best dinner in the house. You've got it coming."

"Let's go," said Mac. "I'm hungry."

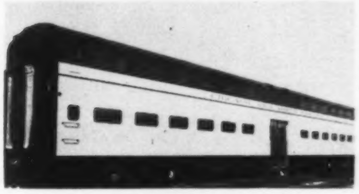
New Air Conditioned Coaches Being Put Into Service

. . . double deck suburban streamliners

SIXTEEN new streamlined air conditioned, double deck coaches are being put into suburban service by the Chicago and North Western Railway Co., Chicago, this spring, according to Paul E. Feucht, president. Dubbed "The Superbanite," each car seats 169 persons, the greatest capacity of any railroad equipment in the country, he said.

While designed basically to fit the needs of heavy suburban traffic, the cars have many features of modern streamliner equipment, such as automatically controlled air conditioning and heating. They also have radiant heating panels in the entrance steps to melt ice and snow.

Each car has an air conditioning unit, with a 16 ton compressor driven by propane gas. Eight tanks of propane gas are mounted under the car along with the air conditioning equipment. A large plenum with blowers and air ducts for distributing air throughout the car is over the center vestibule.



NEW SUBURBAN CARS of the Chicago and North Western Railway Co. have finned radiation in wall panels and 16 ton unit air conditioners. Entrance steps have radiant heating panels to melt ice and snow

Finned radiation along the length of each side of the car on the lower level passes warm air up through wall panels. A narrow slit at the base of the window allows warm air to pass over the window, keeping the sill warm and preventing condensation on the glass.

The upper level is heated by panel radiation and by blowers distributing warm air through overhead vents. In summer, these same ducts distribute cool air.

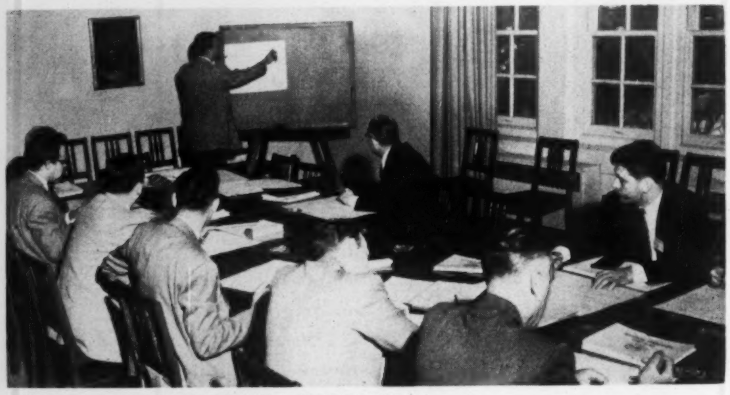
The sides of the car have a 3 in. thick blanket of insulation. Double glazed windows are at both levels.

The cars are being built by the St. Louis Car Co. at a cost of $2¼ million, or $141,000 per car.

The height of the cars is 15 ft 10 in. In order to accommodate them and new dome cars now in west coast passenger service, the seven acre train shed roof, weighing more than 10,000 tons, of the Chicago passenger terminal had to be raised 1 ft.

VIVID DEMONSTRATIONS and . . .

INFORMAL TALKS were followed by . . .



CLASSROOM WORK SESSIONS at . . .

Industrial Ventilation Conference

. . . held at Michigan State. Intensive course was divided into three participation groups, each of which pursued the conference theme of a complete ventilation system for modern industry.

THE FOURTH ANNUAL industrial ventilation conference held at Michigan State College, East Lansing, followed the pattern established by the three preceding conferences. There was a limited number of "talks," with the rest of the time spent in classroom sessions. The theme of the conference can be summarized as follows:

"A complete ventilation system for modern industry must have (1) proper hood and duct design; (2) fan not only of correct capacity, but also properly installed; (3) collector carefully selected to assure efficiency, low maintenance, possible reclaiming of material and handling of waste, as well as recirculation of ventilation air; and (4) comfort and make-up air considered together and provided if the balance of the system is to perform as designed."

The conference was co-sponsored by the division of occupational health of the Michigan Department of Health, and Michigan State's school of engineering. About 225 people registered from many states and Canada; they included plant engineers, contractors, consulting engineers, industrial hygienists, educators, and others interested in the ventilation field.

Known as Working Course

Because of the intensive program, the conference has become known as a working course. At the first general session James Barrett, ventilation supervisor of the Michigan Department of Health, who was responsible for the conference, announced that formality was out and that first names were in order from then on. This informality was carried on throughout the conference and was an aid in getting good discussion periods at the sessions. The group ate all meals together. Classroom work followed the talk or demonstration which was given after each breakfast and lunch. Each registrant had a choice of one of three groups in which he could participate:

1) Basic design problem involving an operation in which cast iron dust was to be controlled, including all fundamentals of hood design and

the detailed calculations for a balanced duct system.

2) Design of more complex systems dealing with heat treating furnaces and large industrial air washers, and including hood design and consideration of the different air temperatures and densities. Registrants for this had to have previous training in balanced duct design and other ventilation design.

3) Design of mine ventilation and the control of dust at the crusher plant.

All of the problems involved the exhausting of fumes, vapors, gases, and dusts to help each person understand the basic problems involved.

As usual, the discussion in each class was the real "meat" of the conference. The instructors were there to lead the "students" and to keep them headed for their ultimate goal, not to dictate.

By cooperation with the ventilation committee of the Conference of Governmental Industrial Hygienists, the new enlarged edition of the Ventilation Manual was used as a text. This manual of recommended practices has proven to be an invaluable aid in the solution of industrial ventilation problems and may be purchased from the Committee on Industrial Ventilation, P. O. Box 345, Lansing, Mich., for $3.00.

Here Are Talks in Brief

Dean Emeritus L. G. Miller of the school of engineering at Michigan State College was the first speaker, and he discussed ventilation for the man in the plant. He emphasized the fact that the average man's temperature varies from 98.6 F blood temperature to skin surface temperatures on the fingers of 93 F and on the feet of 84.6 F; so the wide range of temperatures presents many problems in maintaining comfort for the industrial worker. He discussed the importance of introducing air into the occupied space without causing drafts or objectionable air movement.

Professor C. H. Pesterfield, also of Michigan State College, then worked out several psychrometric problems involving wet and dry bulb temperatures and illustrated how radiant heat may be measured by means of a black globe thermometer. He also demonstrated and discussed the use of temperature, humidity and air movement measuring instruments, and the importance of tests to determine the performance of ventilation systems after installation.

The design of ventilation hoods for control of dust from cast iron machining was discussed by K. E. Robinson, ventilation engineer, General Motors Corp. He explained the fundamentals of hood design and followed this with a series of slides showing the application of these fundamentals to hoods in use that had proven satisfactory.

Corrosion resisting materials was the subject discussed in an open forum on Monday evening. The moderator was E. V. Ivanso, vice president of the Detroit Testing Laboratory. J. E. Guttenplan, of the engineering department of Chrysler Corp., spoke on corrosion resisting metals, and Norman A. Kerstein, of the research department of Detroit Edison Co., explained the differences in coatings and how each might best be applied. Nonmetallic materials were discussed by Dr. L. Gleekman, materials engineer of the Wyandotte Chemical Co. He explained the composition of the various nonmetallic materials and showed samples of each one.

The principles of mine ventilation were presented in a general session on Tuesday morning by John W. Warren, chief ventilation and industrial hygiene engineer at Anaconda Copper Mining Co. He said that some eight tons of air is delivered into the mine for each ton of ore brought out of the ground. He also pointed out that the electrical consumption for the motors driving the fans exceeds that used by the entire city of Helena, Mont.

The subject of providing make-up air was covered by Howard S. Wittmer, assistant manager, Field Division Buildings, Packard Motor Car Co. He stressed the importance of supplying make-up air in quantities equal to those being exhausted, and the economies that might be expected. He illustrated his talk with slides showing several industrial ventilation installations throughout the country. He discussed the desirability of supplying make-up air to the occupied zone in the plant. He pointed out that make-up air heated in the winter and supplied horizontally at the 9 ft level eliminated drafts on the employees. In the summer, the make-up air is directed downward to provide air motion and effective cooling for these same people.

Another installation which Mr. Wittmer discussed involved the problem of supplying make-up air which was sufficiently free of toxicants. Several ducts 12 ft in diameter were installed across the width of the plant to obtain suitable air for make-up. The make-up air was heated by direct fired units using gas as the fuel, and the air was delivered directly to the working area.

An excellent demonstration on control systems for make-up air was given by L. A. Burch, of the R. L. Deppman Co. He used a flockboard in his demonstration for building up the different electric and pneumatic control systems. Each system was operated and explained, and in this way a good understanding of the subject was achieved.

The characteristics of propeller fans, as well as tubeaxial and vaneaxial fans, was presented on Wednesday morning by H. K. Monroe, chief engineer of the Aerovent Fan Co. He also covered the subject of how to select a fan for different jobs.

Color Film Explains Fan Rating

A new color movie showed how fans are rated and explained all of the laboratory tests that must be conducted before the certified rating of the Power Fan Manufacturers Association can be applied. This film was prepared especially for the conference, and it was an effective presentation of the engineering and planning that goes into the manufacture and rating of fans.

Recirculation of Exhaust Air

Next on the program, James Barrett, ventilation engineer, Division of Occupational Health, Michigan Department of Health, who coordinated and arranged for the conference, gave a talk on recirculation of exhaust air. He explained that there is no objection to recirculating non-toxic air, provided the air is cleaned sufficiently to be not objectionable to the personnel.

However, when air contains toxic elements, the degree of toxicity and the method of cleaning the air is important. He mentioned that in some cases even the most efficient dust collectors do not clean the air so that it can be recirculated. He said that the responsibility for the performance of dust collectors is usually with the company that operates them.

Any air cleaning system that is used for preparing exhaust air for recirculation should be checked after installation and also on a regular basis thereafter. Provisions should be made for discharge of the exhaust air at any time whenever the dust collector is not meeting set standards. Signal controls should also be provided which would warn of improper operation of the dust collectors and permit the exhaust air to be discharged outside.

Tour Oldsmobile Plant

The last talk was given by David Lee, ventilation engineer, Oldsmobile Division, General Motors Corp., on the subject of making ventilation pay. He explained the various engineering steps which they use, as well as the tests that are conducted, along with the maintenance procedures followed for proper operation of the ventilation systems.

He illustrated his talk by describing a new ventilation system for the plating of Oldsmobile bumpers. He said that the original calculations and the design of the system were checked by tests after the system was put into operation, and it was found to perform as planned.

Certificates were presented on the last day of the conference to all registrants who completed the course. Following this, an inspection trip was conducted through the Oldsmobile plant to see the manufacture of rocket engines, the sheet metal line where the fenders and other parts of the body are formed, and finally the complete assembly line.

"Key Unit" Piping Fabrication

. . . speeds field erection

By G. W. Hauck
Manager, Engineering Sales
Crane Co.

Problems of field assembly of a piping system are greatly simplified when you start with the key piece or heart of the system as a prefabricated unit. The key unit is easily set into position, with little loss of time, and branch lines can then be installed more quickly after field erection starts. This, of course, means greater economies in field erection costs.

Providing a sizeable start for a piping system is the combined unit of valves, fittings, and fabricated piping in the accompanying illustration. This assembly is the control header and pressure reducing valve station for the boiler plant of a pulp and paper mill.

In this unit, pipe sizes are 18, 14, 12, 10, 8, 6, 4, and 2 in. Gate valves are 600 lb cast steel, while pipe and welding fittings are of Schedule 80, A-106 Grade "B" material. Valves at the left are equipped with built-up bypasses and drains. In the center are two 4 in. pressure reducing valves; the outlets are expanded into 10 in. 90 deg connections. At the right are two 6 x 8 in. pressure reducing valves — 600 to 65 psi and 600 to 150 psi. These outlets are expanded to 18 in. and 12 in. pipe sizes, respectively.

THIS UNIT FABRICATION, 24 ft long, 6 ft high, and weighing 6½ tons, is the control header and pressure reducing valve station for the boiler plant of a pulp and paper mill

Overall length is 24 ft. Maximum height is 5 ft, 11¾ in. Total weight of the unit is 12,900 lb.

Piping was pickled and sandblasted to achieve maximum interior cleanliness. The soundness of all welds was verified by radiography and hydrostatic testing. Production includes two welded supporting bases, plus numerous small connections.

The production of this type of assembly involves accurate cutting, fitting, and layout work, plus specialized skills in welding, stress-relieving, and the like. The end result is a composite assembly which simplifies the beginning of the construction and erection of a sizable system.

The author is a member of HPAC's board of consulting and contributing editors.

ON THE JOB

Space Heaters Speed Building Construction

. . . in sub-zero weather

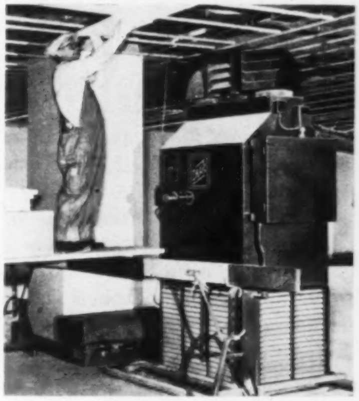
THE TEMPORARY installation of oil fired, forced air space heaters on the various floors of the 41 story Prudential Life Insurance building in Chicago last winter eliminated work interruptions in sub-zero weather, according to the Dravo Corp., saving construction time and money. The heaters kept inside temperatures as much as 40 F above the outside temperature.

As a result, the building — scheduled for September 1955 — will be ready for partial occupancy this summer.

In all, 16 heaters were installed in the building at one time — two on each floor. Fed by portable fuel oil tanks and served by a 220 volt power line, each heater was ready for operation shortly after its placement. They were moved from floor to floor where needed.

The heaters were operated 'round the clock, seven days a week. In addition to maintaining comfortable temperatures for workmen, they were also used for drying plaster, tile and marble installations, as well as concrete and paint.

Each heater has an output capacity of 500,000 Btu per hr, and handles about 5500 cfm of air. A metal duct attached to the heater flue outlet carries fumes outside the building through a nearby window. Cold air drawn into the heater through louvered openings in the lower casing passes over the heat exchanger before being discharged through nozzles on the top of the heater. These nozzles, with directional vanes, can be rotated 360 deg to direct the heat flow to any area. The rise in air temperature is about 80 F, and the discharge velocity is 2000 fpm.



FORCED AIR SPACE HEATERS temporarily installed on skids during construction of Chicago's Prudential Life Insurance Mid-America building permitted work to continue during sub-zero weather

Vermont's First Artificial Ice Rink

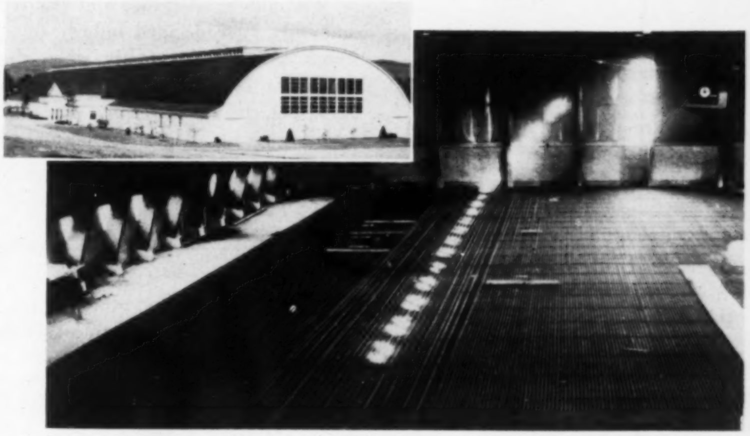
. . . installed at Middlebury college

THE NEW indoor ice rink at Middlebury college is the first artificial ice rink in Vermont, according to the Spang-Chalfant division of the National Supply Co. The rink occupies half of the field house, which is the largest building in the state. The ice surface is 85 ft × 185 ft.

Ten miles of steel pipe is used for circulating the brine refrigerant. This includes 52,239 ft of 1 in. black pipe, as well as small footages of $\frac{1}{2}$ in. to 8 in. black pipe. Refrigeration capacity is over 52 tons, provided by two four cylinder compressors, through 8 in. mains and a three pipe reverse header system. The headers are graduated from 8 in. to 4 in.

The 1 in. pipe is spaced on 4 in. centers throughout most of the rink area, and on 3 in. centers at the edges. Each section of pipe forms a long loop, extending from the feed line to a hairpin bend at the opposite end of the rink, and then back to the return header. The lengths of pipe are welded together and are supported on $\frac{1}{2}$ in. steel pipe placed 6 ft apart.

Before the pipe was laid, a base of $2\frac{1}{2}$ in. cellular glass insulation blocks, over concrete, was put in place. The pipe is embedded to the center line in concrete, and above that with road asphalt to a thickness of $\frac{3}{4}$ in. above the pipes.



NEW INDOOR ICE RINK — 85 × 185 ft — occupying one end of field house has 10 miles of steel pipe partially embedded in concrete above cellular glass insulation blocks. The piping system is covered with road asphalt, the finish surface, which permits the use of the field house for tennis and other events

QUESTION OF THE MONTH

How Can Heating Fuel Be Saved?

THE QUESTION, *What's the Best Way To Save Heating Fuel?*, was published previously in HPAC and is repeated here for information, with one of several answers that have been received from HPAC's readers. Other comments for publication will also be welcome.

"There are many things that can be done to save fuel required for building heating, but I wonder if it is possible to say what the one most effective method of heating fuel conservation would be? I'd be interested in any comments from readers as to what management of the 'average' small industrial plant or commercial building should look for when the possibilities of fuel conservation are being considered?"

H. B. WAYNE —

"Depends On Structure —Here Are Some Tips"

THE ANSWERS to fuel savings depend to some extent on the type of construction. For new construction, selection of a heating system giving nearly constant heat input with minimum temperature variation — cycling — is most economical for fuel savings. A system employing sensible heat gain permits maintaining a constant temperature level. Provision for zoning various sections of the building allows independent temperature control for any area without causing temperature changes in other sections. Fuel firing rate will be nearly constant, allowing the boilers to operate at maximum efficiency giving greatest effective fuel utilization with minimum maintenance.

For an existing structure, many factors influence fuel savings.

1) Insulated piping and ducts are necessary so as to prevent excessive heat losses to surrounding areas where the heat is not needed, which in turn causes a failure to maintain the other required temperatures.

2) Check building construction for high air leakage. This is especially true for older structures built of brick and/or stone, where the mortar is loose and falling away. Cracks around window frames and doors also contribute to these losses. Caulking and application of weather stripping will reduce them.

3) Check heat consuming areas for losses due to carelessness by the occupants. Frequently, personnel open windows, transoms, and doors, because of too much heat in a certain area. This may cause a temperature drop in adjacent spaces. Occupants in these adjacent rooms will demand more heat and the cycle is expanded, resulting in Btu's "going out the window." Installation of zoning facilities, such as air dampers and/or individual room thermostats, will help eliminate this problem by allowing individual control.

Wet bulb temperature and relative humidity have decided influences on comfort. Quite frequently when the room air temperature is not excessive, but, being extremely dry, discomfort results. Then, the occupants will open windows, transoms and doors to supposedly cool the area, but find the discomfort persists. Introduction of humidified air will contribute greatly to comfort without accompanying high heat losses.

4) Steady-state fuel firing. A thermostat designed to maintain nearly constant temperature without having the fuel firing rate fluctuate or cycle is a definite aid for reducing fuel waste. Temperature controls are available that meet these requirements. Old thermostats should be inspected, and if found faulty, they should be repaired or replaced.

Each building has certain requirements peculiar to its design and function. The cost for making changes will vary and can be appreciable. A study comparing first cost with estimated fuel savings will indicate which procedure will be most economical for the estimated life of the heating system and building. An intangible frequently overlooked is the improved personnel relations and greater efficiency and output resulting from better heat distribution.—H. B. WAYNE, Consulting Engineer.

• *YOU ARE INVITED to contribute a question for publication, or an answer to a published question. Please address your reply to the Editors, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2.*

READER ASKS —

"When Should We Use Our Own Men for Plant Piping Changes?"

"We have some 40 maintenance men at our plant, eight of whom are pipefitters. On extensive piping changes in the plant, we usually call in an outside piping contractor. We must decide on any piping work, other than ordinary maintenance and minor changes, whether to have our own men do it or whether to call in an outside contractor. One of the main problems is to decide how long we can tie up our men on new piping work, always remembering that ordinary maintenance must be kept up and that an emergency breakdown is an ever present possibility.

"I would be most interested in any comment from other HPAC readers on this question."—B.L.A.

HPAC DATA SHEET

Comparing Air Conditioning Systems for Office Buildings

THREE BASIC SYSTEMS which may be used to air condition office buildings are the central plant, the self-contained air conditioner, and the room cooler systems. Features of these three methods are compared in the accompanying chart, which shows at a glance the characteristics of each on 10 different points.

The comparison is based on a properly designed central plant as the ultimate and assumes the ultimate in self-contained and room coolers. The table is from *Air Conditioning Guide for Office Buildings*, prepared by The Electrical Association and the Building Owners' and Managers' Association of Philadelphia.

Copies of the booklet may be obtained for $1.00 from the Building Owners' and Managers' Association, 1604 Lincoln-Liberty Bldg., Philadelphia 7.

Item	*Central Plant*	*Self-Contained*	*Room Coolers*
1. Control of dry bulb temperatures.	**Excellent control.**	**Good control.**	**Good control.**
2. Control of wet bulb or relative humidity.	**Excellent control.**	**Will maintain the wet bulb temperature within the comfort zone. Excellent control possible with the addition of reheat and humidity control.**	**Provides limited control of wet bulb temperature. Some control may be accomplished manually by the intelligent adjustment of the fresh air damper and dry bulb temperature setting as atmospheric conditions change.**
3. Outdoor air supply.	**Fixed by design to produce the desired result.**	**Fixed by design to produce the desired result.**	**Fixed by design of the equipment and may be affected by outside wind velocities. Must be adjusted as atmospheric conditions change to maintain maximum cooling capacity.**
4. Air filtration.	**Maximum filtration.**	**Satisfactory filtration obtained with filters supplied with equipment. Maximum filtration may be obtained by addition of supplementary filters.**	**Satisfactory filtration obtained with filters supplied with equipment.**
***NOTE:* Satisfactory filtration cannot be maintained in any system without proper maintenance of filters.**			
5. Air motion.	**Control by design.**	**When used with duct work and diffusers will produce the same results as central plant. When used without ducts satisfactory operation depends upon the velocities at the outlets to spread or travel from the unit, ceiling heights, ceiling obstructions, etc.**	**Adjustable by dampers or grilles within the unit but limited by the design of the equipment.**

Item	*Central Plant*	*Self-Contained*	*Room Coolers*
6. Distribution.	To any desired location.	When installed with duct work distribution may be to any desired location. When installed without duct work distribution without objectionable drafts will depend upon the length of throw, ceiling heights, ceiling obstructions, etc.	Units are confined to window locations and the area immediately surrounding the window. Satisfactory distribution within this space will depend upon air throw, obstructions in the area, ceiling heights, etc.
7. *Zoning:* (a) Refrigeration Capacity.	Zone design results in the maximum use of equipment with minimum refrigeration capacity.	When used with ducts the same zoning effects may, under certain conditions, be obtained as for central plant.	Zoning is not possible. Therefore, each unit must be sized for the maximum requirement of the area being served.
(b) Temperature Control.	Can be achieved in all systems with a considerable variance in cost and complexity of design.	Can be achieved with the use of ducts and controls or multiple units.	Inherent in the design of the equipment.
8. Year-Round Air Conditioning.	May be incorporated in the design.	Not suitable for year-round operation. May be used during the winter months for ventilating purposes.	Designed primarily for summer cooling and winter ventilation.
9. Useful Life.	30 years.	15 years.	8 to 10 years.
10. Applications.	(a) New buildings where a capacity of 100 tons or more is required.	(a) Where the space to be conditioned can be served by a single unit or units.	(a) Individual offices or rooms.
	(b) Existing buildings where the possible income justifies a long term investment.	(b) Where a part or entire floor (or floors) of a building is to be conditioned separately.	(b) Where a short term investment is indicated.
	(c) All buildings where year-round air conditioning is required.	(c) Where the equipment is owned by the tenant.	(c) Low first cost is a prime consideration.
	(d) Where the replacement of a building heating system is being considered, together with air conditioning, the two may be combined in a single design at a considerable saving.	(d) Where impractical to use other types of equipment because of required building alterations.	(d) Where installation time and convenience of installation is an important consideration.
			(e) Where the design and/or the occupancy of the building make the use of room coolers practical and desirable.
			(f) Where impractical to use other types of equipment because of required building alterations.

HEATING, PIPING & AIR CONDITIONING

AMERICAN SOCIETY OF
HEATING AND AIR-CONDITIONING ENGINEERS

Journal Section

The object of the Society is to advance the arts and sciences of heating, ventilating, cooling and air conditioning, and the allied arts and sciences, for the benefit of the general public, to encourage and conduct scientific research, and to cooperate with other organizations having the same or similar objectives.

A Method for Determining Winter Design Temperatures

By M. K. Thomas*, Toronto, Ont., Canada

SUMMARY—A logical method of arriving at winter design temperatures for Canadian conditions is described. The method makes use of the probable frequency of occurence of low temperatures during January. A tabulation of design temperatures on four different bases of frequency of occurrence is presented for 15 Canadian localities and these temperatures are compared with the design temperatures in common use. An outline map of Canada with winter design temperature lines is included. It is shown that at Toronto and Montreal, city weather stations report winter temperatures slightly higher than those read at the adjacent airports.

A WINTER design temperature may be broadly defined as the coldest temperature which is likely to recur frequently enough during the average winter to justify its use in the design of heating systems for structures. These temperatures are used in calculating the heat loss which such systems may be called upon to overcome in normal operation.

While winter design temperatures have been used for some time in Canada, no one has as yet published a method by which these temperatures may be selected on a systematic basis across the country. In the past some designers have used values obtained by adjusting the extreme or average minimum temperatures according to a rule, while others have estimated values directly. In the preparation of winter design temperature charts for the Climate Part of the revised National Building Code of Canada, it was necessary to devise a logical method for obtaining these temperatures and to give a specific definition to a Canadian winter design temperature.

At the first meeting of the Technical Committee on Climate for the National Building Code, it was decided to select design temperatures on the bases of four probabilities (1, 2½, 5 and 10 percent) so that the designer might have a choice according to the heat capacity and the use of a building. Considering the volume of calculations involved in obtaining these design temperatures, it was also decided to base them on conditions during the coldest month of the year only. Accordingly, the following definition was adopted: *Winter design temperatures for bases of 1, 2½, 5 and 10 percent are the temperature values expressed in Fahrenheit degrees at or below which 1, 2½, 5 and 10 percent of the January hourly outdoor temperatures occur.*

Method

January is usually the coldest month of the year throughout most of Canada†. Normal January temperatures range from +10 to +25 deg in the more densely settled portion of Eastern Canada, from −5 to +15 deg in the southern Prairie Provinces and from +15 to +35 deg in settled British Columbia. While a longer period of time would have been desirable, the 10 Januaries from 1941 to 1950 inclusive, were chosen as a basis for this study. However, the period proved to be fairly representative, as the departures from normal of the mean January temperature during this period were mostly within the range −1 to +2 deg in settled Southern Canada and +4 to −2 deg in Northern Canada. The largest departures from the long term normal occurred in the sparsely settled Mackenzie Valley and Yukon Territory.

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†February averages colder only in Southern Ontario, Nova Scotia and New Foundland where the difference varies from 0 to −2 deg and in the Arctic Islands where the differences are 0 to −6 deg. Most differences, except in the Arctic, are 1 deg or less.

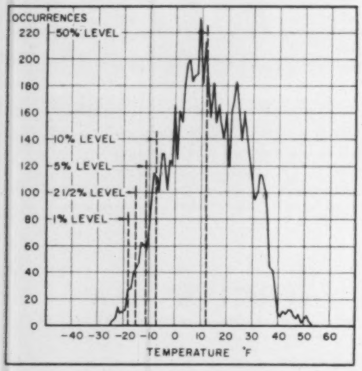

Fig. 1—January hourly temperature frequencies at Ottawa, Ont., for the period 1941-1950. Temperature frequencies have been accumulated from the coldest temperature upward to indicate the 1, 2½, 5, 10, and 50 percent levels

The first step was to analyze the hourly temperature frequencies from 10 representative locations. The hourly temperature records for 100,000 observations were transferred to punched cards for machine analysis, from which it became apparent that more information was needed. Hourly temperature frequencies for an additional 25 stations were then obtained by clerical methods for the coldest 10 percent of the hours.

To obtain design temperatures for the desired (or any) percentage level at these 35 stations, it was necessary to accumulate the temperature frequencies from the lowest temperature up to the desired percentage level. The frequency distribution of 7,440 January hourly temperatures at Ottawa is shown in Fig. 1. The position of the 74th lowest temperature is indicated as the 1 percent level, the 186th as the 2½ percent level, the 372nd as the 5 percent level and the 744th as the 10 percent level. The 50 percent level and the mean January temperature for the same 1941-1950 period are also shown.

In order to obtain a more complete coverage of the country, a member of the National Building Code Committee on Climate, H.C.S. Thom of the U. S. Weather Bureau suggested the use of a relationship between (1) the variability of January monthly mean temperatures, and (2) the difference between the monthly mean temperature and the design temperature. As Canada is divided into several regions according to the type of temperature frequency distribution, the use of several regional relationships was suggested. Fig. 2 illustrates the different types of temperature distribution and indicates the need for regional relationships. The Vancouver frequency distribution illustrates the compact distribution of hourly temperatures typical of the maritime climate along the Pacific Coast which was also found to exist in the Great Lakes region of southern Ontario. The broad Edmonton distribution is representative of the continental climate in Western Canada, while the intermediate Moncton distribution is typical of stations in Eastern Canada. Fig. 3 shows the different regions into which the country was divided along with the location of the stations for which design temperature values were obtained.

To obtain these regional relationships, monthly mean temperatures and standard deviations were calculated from the 35 locations for the 10-year period 1941-1950. Standard deviations in Southern Canada were about 3 deg along the Atlantic Coast and increased steadily to 13 deg in Alberta and interior British Columbia and then decreased to 5 deg along the Pacific Coast. In Northern Canada the values exceeded 8 deg in the Eastern Arctic decreasing to 4 deg in the Western Arctic.

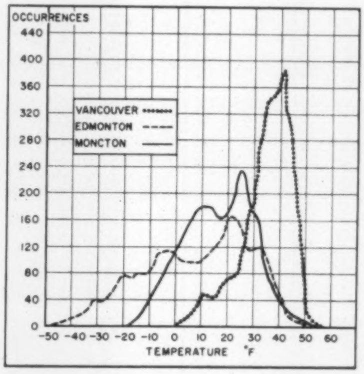

Fig. 2—January hourly temperature frequencies at Vancouver, B. C., Edmonton, Alta., and Moncton, N. B., for the period 1941-1950. The curves have been smoothed

The standard deviation value for each station was plotted against the difference between the mean temperature and the known 2½ percent design temperature. These plots and the resulting lines of best fit are shown in Fig. 4. An excellent relationship was apparent for the Western Canada stations. The three plots which do not lie along the line (C)

Table 1—Comparison of City and Airport Winter Design Temperatures at Toronto and Montreal (Fahrenheit degrees)

	January 1941-1950		Design Temperatures Percent			
	Mean Temperature	Standard Deviation	1	2½	5	10
Toronto						
City	24.5	5.2	−4	0	5	10
Airport	21.2	5.7	−9	−4	1	6
Difference	3.3	−0.5	5	4	4	4
Montreal						
City	16.1	4.7	−12	−9	−6	−2
Airport	14.9	5.1	−14	−11	−8	−4
Difference	1.2	−0.4	2	2	2	2

represent stations on the edge of this region. The Eastern Canada plots were more scattered than the first group but are represented fairly well by line (B). Although the method of least squares was used to obtain the original relationship lines it was found that satisfactory lines could be drawn by inspection of the plotted points. The values for the Maritime stations were bunched and so the line (A) was given the same slope as (B). Similarly a line (D) was drawn through the single Yukon stations which was parallel to the relationship line (C).

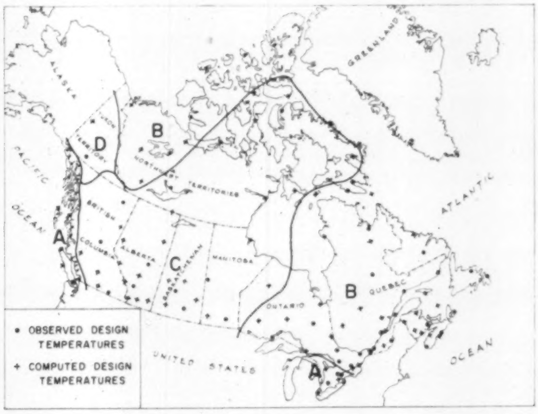

Fig. 3—Zones of regional relationships and location of stations from which data were used

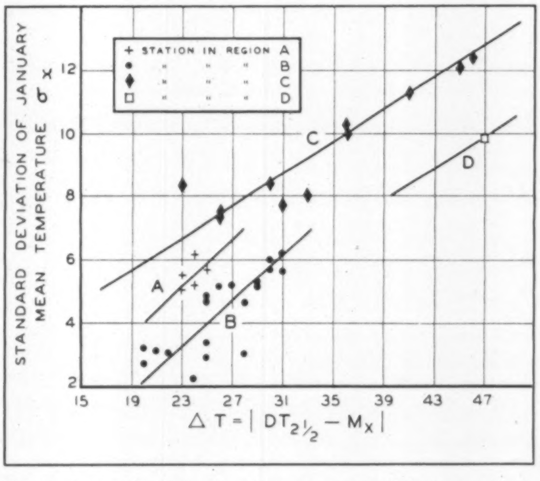

Fig. 4—Regional relationships between standard deviation (σ_X) and the difference between the mean temperature and the winter design temperature — 2½ percent basis

To utilize these relationship lines, January mean temperatures and standard deviations were calculated for an additional 80 stations for the period 1941-1950. Knowing the standard deviation and using the proper regional relationship line, the difference was read off between the mean temperature and the 2½ percent design temperature. Since the mean temperature was also known, the calculated design temperature was obtained by subtracting the previously mentioned difference from the mean temperature. The data from stations near the boundaries of different zones were adjusted accordingly as were data at stations with known unusual climatological characteristics. The design temperature values were plotted and the chart shown in Fig. 5 was drawn. In settled Southern Canada these values range from −35 deg in the interior to 0 deg on the Atlantic Coast and 10 deg on the Pacific Coast.

Similar procedures could have been used to obtain relationships for the 1, 5 and 10 percent levels. This was attempted but it was found to be just as accurate if values were estimated using, with necessary adjustments, the basic relationships already found. In each region there were several locations where the exact frequencies were known for the lowest 10 percent of the temperatures. These observed design temperatures were used as reference points in estimating values for the other eighty locations. The resulting charts are similar in appearance to the 2½ percent basis chart and are not shown here.

Comparison of City and Airport Design Temperatures

As hourly temperature data were available for city and airport stations at Toronto and Montreal, winter design temperatures were obtained for these stations and are shown in Table 1. As a result of the urban influence, city temperatures in the winter are usually slightly higher than those at adjacent airports. Since these two cities are the largest metropolitan areas in Canada, larger city-airport differences are not expected in other urban areas. At Toronto and Montreal, differences in design temperatures between city and airport sites are about one degree greater than the differences between mean temperatures.

Comparison of TAC 97½ Percent Basis and Canadian 2½ Percent Basis Winter Design Temperatures

Many readers will be interested in seeing how the design temperatures as obtained by this Canadian method compare with design temperatures selected by the ASHAE Technical

Advisory Committee 97½ percent basis. This latter temperature is defined as *the hourly out-door temperature which has been equalled or exceeded 97½ percent of the total hours in December, January and February for the period of record.* The major difference is that the TAC method uses the three winter months instead of the single coldest month used in this paper. A minor difference in procedure is that the TAC method accumulates the temperature frequencies from the highest temperature down, while the method described here accumulates from the lowest temperature upward. A difference of 3 deg was found between the two methods at Toronto. The TAC 97½ percent value, based on December, January and February is +3 deg, while the present method gives a value of 0 deg on the 2½ percent level based on January temperatures alone.

Summary of Winter Design and Related Temperatures

In summary, Table 2 is a tabulation which lists for 15 Canadian cities various winter design, mean and extreme temperatures. The Canadian design temperatures are based on the period 1941-1950 and where indicated are derived from airport temperature values. The standard temperature values are from 30-year records which are either entirely city records or a fairly homogeneous combination of city and airport records.

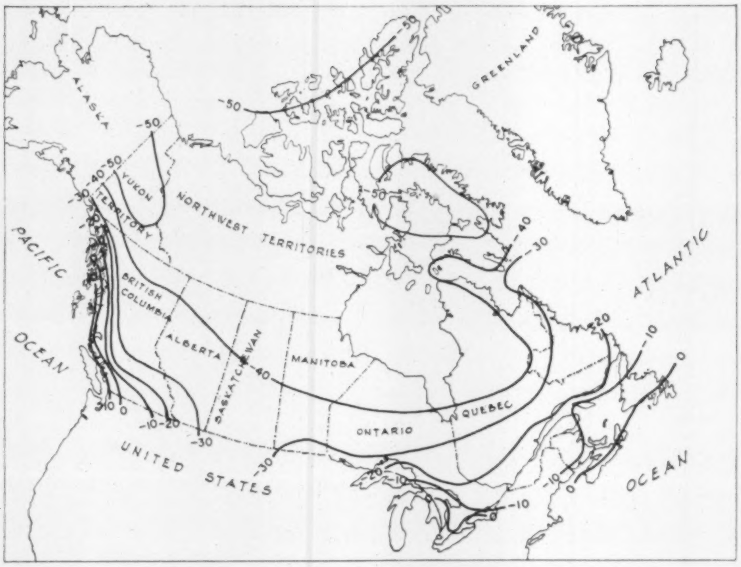

Fig. 5—Winter design temperature — 2½ percent basis Fahrenheit degrees

Table 2—Winter Design and Comparative Temperatures at 15 Locations in Canada (Fahrenheit degrees)

Station[a]	Winter Design Temp[b] Percent				Design Temp in Common Use[c]	30-Year Standard Values		
	1	2½	5	10		Mean January Temp[d]	Mean Annual Minimum[e]	Extreme Minimum[f]
Vancouver (A), B.C.	8	11	15	21	10	36	13	0
Edmonton (A), Alta.	−39	−33	−29	−21	−40	8	−39	−55
Regina (A), Sask.	−39	−34	−30	−25	—	2	−39	−54
Churchill (A), Man.	−43	−42	−40	−37	—	−16	−43	−50
Winnipeg (A), Man.	−33	−29	−25	−21	−35	1	−35	−44
Ottawa (A), Ont.	−18	−15	−11	− 7	−20	12	−26	−38
Toronto, Ont.	− 4	0	5	10	−10	24	− 7	−22
Montreal, Que.	−12	− 9	− 6	− 2	−15	15	−16	−29
Quebec, Que.	−16	−12	− 9	− 4	−20	12	−19	−32
Saint John, N.B.	− 6	− 3	0	5	—	20	−12	−21
Halifax, N.S.	0	4	7	11	—	32	− 6	−21
Charlottetown, P.E.I.	− 6	− 3	0	4	−10	19	−11	−23
St. John's (A), Nfld.	− 1	1	4	7	−10	24	− 2	−10
Goose Bay (A), Nfld.	−29	−26	−24	−20	—	0	−30	−35
Dawson, Y.T.	−62	−56	−50	−39	−45	−16	−54	−73

[a] (A) indicates that observations were taken at the airport for the 10-year period 1941-1950.

[b] Based on January 1941-1950.

[c] HEATING, VENTILATING, AIR CONDITIONING GUIDE 1954, Chapter 12, p. 245 (published by AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS, INC., New York, N. Y.)

[d, e, f] Thirty-year standard values are based on the period 1921-1950 and are either entirely city records or a fairly homogeneous combination of city and airport. The periods at Churchill, St. John's and Goose Bay are less than 30 years.

Study of the tabulation reveals that apparently the design temperatures in common use have been selected with the mean annual minimum temperature in mind since there is close correlation. These temperatures in common use, while never as low as the 30-year extreme minimum temperature, are usually lower than both the 1 and 2½ percent basis design temperatures as selected in this study.

Acknowledgments

This paper records work done by the author in connection with the revision of the National Building Code of Canada. This was carried out as part of the author's duties as Climatologist to the Division of Building Research of the National Research Council (1951-1953), to which position he was seconded from the Meteorological Division, Department of Transport. The paper is published with the approval of Andrew Thomson, Controller of the Meteorological Division and of R. F. Legget, Director of the Division of Building Research, under whose immediate direction the project was undertaken. The Central Mortgage and Housing Corp., Ottawa, cooperated by transferring temperature data to cards for machine analysis.

Resistance of Wooden Louvers to Fluid Flow[†]

By C. W. Bevier[*], College Station, Tex.

SUMMARY — Louvers tapered at both entrance and exit sides were found to give best fluid flow performance in tests of various air deflecting arrangements utilizing wood. Termed nozzle-section louvers because flow simulates that of a nozzle or venturi, they surpassed standard, inverted, and diffuser-section arrangements. A working chart, Fig. 11, is useful in applying the data to some of the conditions frequently encountered. This is a continuation of work described in an earlier article[1].

THERE HAS been engineering thought to the effect that louvers used for air intakes on cooling towers may be responsible for as much as 20 percent of the total pressure loss of induced draft cooling towers and that spray eliminators (another arrangement of louvers) may account for an additional 20 percent.[2] Also of concern have been the louvers used for both intake and outlet of some attic fan installations in which the pressure drop affects both capacity and cost of operation.

It is obvious from these examples that any change in the design of louvers which reduces the cost of operation without adversely affecting other costs is desirable. The research reported here was undertaken with such considerations in view and was concerned primarily with the measurement of pressure drop through louvers of several designs to determine not only the characteristics of those louvers, but also principles of general application.

The general approach to this subject and an analysis of the problem together with an explanation of how the calculations were made are all contained in the Appendix.

Equipment

The test setup illustrated in Figs. 1 and 2 consists of a 24-in. centrifugal fan (driven by a 2-hp, 3-phase, 220-volt motor) discharging air through one of two 13-in. diameter by 11 ft long ducts into a plenum chamber 7 ft by 11 ft in plan dimensions and 7 ft high.

Attached to the exit of the plenum chamber is a square duct 4.5 ft long and 3 sq ft in area. The louver to be tested is fixed to the end of this duct. Inside the plenum chamber are 5 concentric cone diffusers designed to distribute the air uniformly and to give the chamber the effect of a large room. In addition, there is a bell-shaped entrance leading from the plenum chamber into the 3 sq ft duct extension, the purpose of which was to direct the air smoothly to the inlet side of the louver.

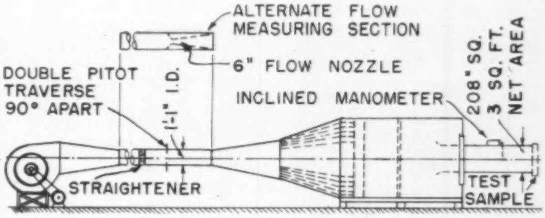

Fig. 1—Test setup

One of the 13-in. ducts connecting the fan and chamber contains a 6-in. diameter flow nozzle used to measure low-to-intermediate rates of flow. The other duct is equipped for a 20-point Pitot tube traverse used to measure intermediate-to-high rates of flow. The ducts are so arranged that they can be lowered or raised into position as the air flow rate requires. For a given test the air flow rate was fixed by the adjustment of movable vanes at the entrance to the fan.

Pressure measurements were made with inclined and inclined-vertical manometers. The manometers were calibrated with a micro-manometer, and all readings corrected for temperature to standard density of water. The velocity pressure for the flow nozzle was obtained from a manometer connected between an upstream static tap and a tap at the throat of the nozzle. The same manometer was connected to the Pitot tube when it was in use. The static pressure loss through the louver was obtained from a manometer connected to a static pressure tap located 2 ft in front of the louver within the duct extension to which the louver was connected. Barometric pressure was determined from a mercury column barometer and corrected for temperature, elevation, and gravity by usual methods.

Wet- and dry-bulb temperature measurements were made with two 0- to 120-F mercury-filled glass thermometers having 0.5 deg graduations. The thermometers were placed near the inlet side of the blower.

Description of Louvers

Tests were run on four types of louvers as illustrated in Fig. 3. All louver boards were 20.78 in. long; made from wood stock 13/16 in. thick, and sanded to a smooth finish so that the surface conditions were nearly uniform throughout all tests.

Louvers were assembled by using sheet metal flanges as shown in Fig. 2. Various arrangements for each type of louver were obtained by changing the width, the number of louver boards or angle of slope.

The first series of tests was run on the standard louvers. These louvers

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[†] Based on the author's thesis submitted to the Graduate School of A. & M. College of Texas in fulfillment of a requirement for an M.S. in Mechanical Engineering.

[*] Research Assistant, Texas Engineering Experiment Station, Texas A. & M. College System.

For presentation at the Semi-Annual Meeting of the AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS, San Francisco, Calif., June 1955.

[1] Exponent numerals refer to References.

were made of boards of uniform thickness and widths of 3, 6, 8-1/8, and 9 in.

Results obtained from these tests indicated that the width of the louver boards has an appreciable effect on the pressure loss; that is, the exit portion of the louver affects the flow.

This observation was the reason for testing the diffuser-section louvers. It was believed that if a diffuser-type exit section could be incorporated in the louver, a pressure recovery would occur similar to that obtained in the diffuser section of a venturi tube, ejector, or similar device. Boards for the diffuser-section louvers were made from the standard louver boards by placing them in a jig and passing the assembly through a planer which cut off the upper half of the boards, thus leaving the desired shape. Dimensions of the three sizes of diffuser-section louvers tested are shown in Fig. 4.

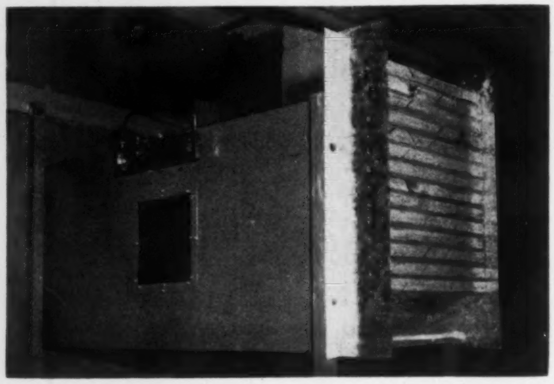
Fig. 2—Louver and inlet duct attached to plenum chamber

In testing the diffuser-section louvers, observations led to the belief that turbulence caused by the type of entrance was appreciably affecting the flow conditions and possibly accounted for the increase in pressure loss as compared to the standard louver. With this thought in mind, it was decided to invert the diffuser-section louver boards and thus obtain a shape approximating that of an airfoil. The flow passage thus formed was similar to that of a nozzle or venturi and, consequently, these louvers were called nozzle-section louvers.

The considerations which led to the inversion of the diffuser-section louver boards also suggested the inversion of the standard louver boards. To simplify the geometry of the inverted louvers thereby obtained, a zero overlap of the louver boards was maintained throughout this series of tests. The different arrangements of louver boards were obtained by varying the spacing of the louver boards, which, because of maintaining zero overlap, required changing the widths of the boards.

The inverted louver boards were made for approach angles of 30, 45, and 60 deg. The widths varied from 2.99 in. to 10.39 in.

Experimentation

The test procedure consisted of selecting a particular type of louver board, varying the dimensions and arrangement of the louver boards, and of obtaining the pressure loss through the louver at different rates of air flow. Because the face area of the louvers was fixed by the size of the entrance duct, the values of *d, s,* and the free area ratio were determined by the number of boards used in any given arrangement. Table 1 gives a summary of the various louver arrangements tested. Most of the louvers were tested at four different rates of flow adjusted to give approximately equal increments of pressure loss.

Air volumes were measured by means of either the 6-in. flow nozzle or the Pitot tube. The flow nozzle was used whenever possible because of the ease of obtaining data. However, as the free area ratio increased, the air volume increased beyond the capacity of the nozzle; therefore, fewer tests were possible using this method, and the Pitot tube was then used. To check the difference in results obtained by the two methods two tests were run completely using the nozzle and then rerun using the Pitot tube. The difference in the results from the two methods was negligible.

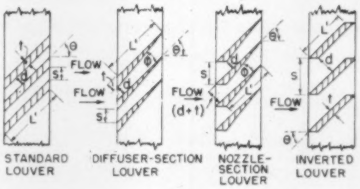

Fig. 3—Louver arrangements tested

In all tests, flow and temperatures in the system were allowed to become steady before any measurements were made. When using the flow nozzle three readings of the manometers were taken during each run, while temperatures were recorded only at the beginning and end of a run. The average of the readings was used in calculations.

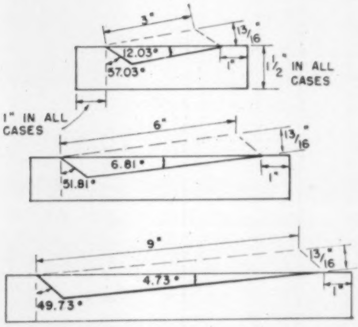

Fig. 4—Louver board jigs

When the Pitot tube was used, the velocity pressure was obtained by squaring the average of the square roots of 20 traverse points located at the centers of equal annular areas as prescribed by the fan test code.[3] Manometer readings for the pressure drop through the louvers, and the temperatures, were recorded at the beginning, halfway point, and end of the traverse and the average of the readings was used in calculations.

At all times care was taken to insure a minimum amount of air leakage between the point of flow measurement and the louver. Masking tape was used to seal cracks. The test setup was checked for leakage and the amount found to be less than 1 percent of the air delivered by the fan, using the test for leakage previously outlined.[4]

Table 1—Summary of Louver Arrangements Tested

Standard Louvers		
Width of Louver Boards In.	Number of Louver Boards	Approach Angle, θ, Deg
3	6, 7, 8, 9	45
6	4, 5, 6, 7, 8, 9	45
8-1/8	7, 8, 9	45
9	4, 5, 6, 7, 8, 9	45

Diffuser-Section Louvers			
Width of Louver Boards In.	Number of Louver Boards	Approach Angle, θ, Deg	Diffuser Angle, Φ, Deg
3	8	45	12.03
6	8	45	6.81
9	8	45	4.73

Nozzle-Section Louvers			
Width of Louver Boards In.	Number of Louver Boards	Approach Angle, θ, Deg	Diffuser Angle, Φ, Deg
6	4, 5, 6, 7, 8	45	6.81
9	4, 5, 6, 7, 8	45	4.73

Inverted Louvers		
Width of Louver Boards In.	Number of Louver Boards	Approach Angle θ, Deg
6.00	4	30
4.00	6	30
3.00	8	30
7.35	4	45
4.90	6	45
3.68	8	45
10.39	4	60
6.93	6	60
5.20	8	60

The velocity front of the air in the 13-in. flow measurement duct containing the Pitot tube was checked for various positions of an egg-crate type straightener. The straightener was finally located at the entrance to the duct, because this location gave the most uniform velocity front at the Pitot tube.

Results and Discussion

Standard Louvers: Fig. 5 represents graphically the effect of the width of the louver boards on louver performance. Because the curves are for a given pseudo Reynolds number, and because ratio d is constant for a given free area, each curve of Fig. 5 approximately represents a constant velocity depending on the magnitude of the free area ratio. Under these conditions a decrease in the resistance coefficient for a given free area ratio gives a decrease in the pressure loss through the louver. These curves indicate, therefore, that for a given area ratio, as the width of the louver board increases, the pressure loss through the louver decreases until a minimum is reached; then further increase of the width causes the pressure loss to increase.

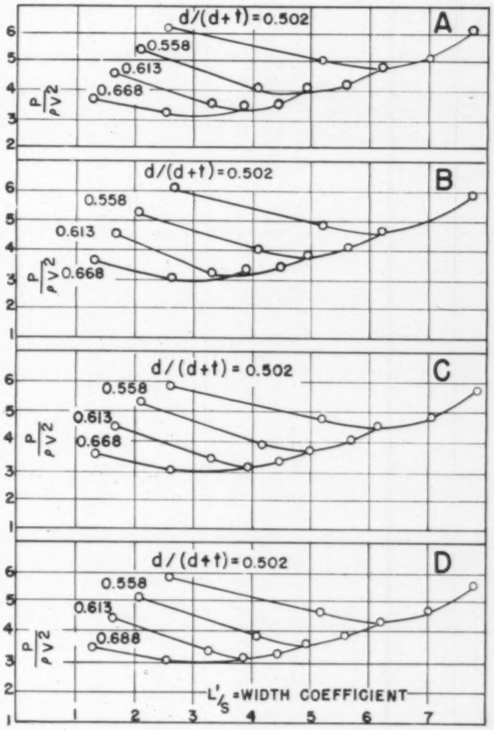

Fig. 5—Variation of resistance coefficient ($P/\rho v^2$) with the width coefficient (L'/s) for different values of free area ratio. Pseudo Reynolds number is constant at 4000 at A, 6000 at B, 8000 at C, and 10,000 at D. $d/s = \cos\theta = 0.707$, all cases (standard louvers)

Apparently, as the width increased, the flow conditions were at first improved and a smaller turbulence loss occurred, resulting in a smaller overall pressure loss. However, as the width was further increased, the friction loss increased with enlarged surface area, thereby causing greater overall resistance.

The curves in Fig. 5 also show that, as the free area ratio increases, the minimum value of the resistance coefficient occurs at smaller values of the width coefficient. And, if the thickness is held constant, it can be shown by reference to these curves, that a decrease in the free area ratio causes a decrease in the width required for minimum resistance. It may also be shown that a decrease in the thickness causes a very noticeable decrease in the width required for minimum resistance. These effects can be explained by the fact that as the thickness is reduced for a given free area ratio, the area open to flow is reduced and the velocity in the louver must increase. The increase in velocity causes the friction loss to increase, and hence an overall increase in pressure loss occurs at a smaller width.

As the free area ratio increases, the change in the resistance coefficient becomes progressively less. Because the velocity within the louver is reduced as the free area ratio is increased, a decrease in the turbulence results. Hence, additional reduction in the turbulence with increasing width of the louver board may not follow. Also, the fluid friction is reduced for higher free area ratios, because there are fewer boards per unit of face area, and a corresponding reduction of surface area. Consequently, the change in the friction loss with a change in width becomes less significant.

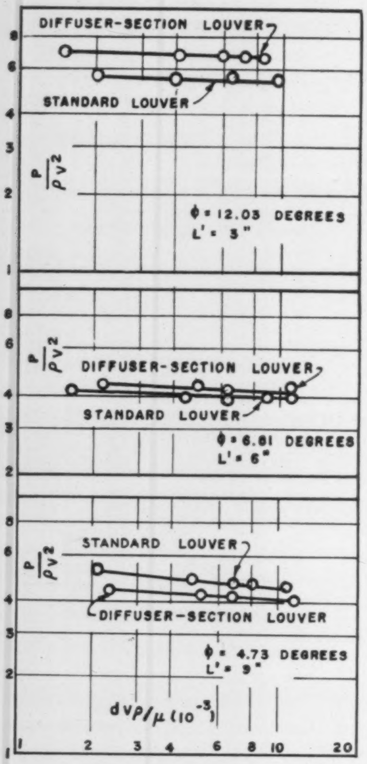

Fig. 6—Variation of resistance coefficient $(P/\rho v^3)$ with Reynolds number $[dv\rho/\mu\ (10^{-3})]$ for different values of free area ratio (diffuser-section louver and standard louver). $\theta = 45$ deg, all cases. $d/(d + t) = 0.558$

If the curves of Fig. 5 were superimposed, it would be seen that the curves almost coincide. This means that the pseudo Reynolds number affects these curves very little. Evidently the flow through the louvers is so turbulent that the viscous forces are not significant. This conclusion is strengthened by the fact that at the low pseudo Reynolds numbers the curves tend to be less coincident, which is consistent with the fact that at low Reynolds numbers the flow becomes less turbulent and approaches laminar flow conditions.

Diffuser-Section Louvers: Results of tests of the diffuser-section louvers are shown in Figs. 6, 7 and 8. In these figures a comparison is made between the diffuser-section louver and the standard louver, each having the same free area ratio, width, and approach angle.

The change in the resistance coefficient with a change in the pseudo Reynolds number for a given width, free area ratio, and approach angle is shown in Fig. 6. These curves show that as the width of the boards increases, the resistance of the diffuser-section louver decreases, and that, compared to the standard louver, for a louver board width of 3 in. the resistance of the diffuser-section louver is greater, but for a 9-in. width it is less than that of the standard louver. This result can be explained by the fact that both the diffuser angle and the discharge angle of the air are reduced as the width is increased.

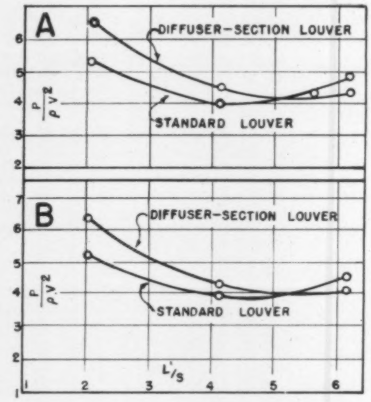

Fig. 7—Variation of resistance coefficient $(P/\rho v^2)$ with the width coefficient (L'/s) for diffuser-section louvers and standard louvers. Pseudo Reynolds number $[dv\rho/\mu\ (10^{-3})]$ is 4000 at A, and 8000 at B. $d/(d + t) = 0.558$, all cases. $\theta = 45$ deg, all cases

If the resistance coefficient is plotted against the width coefficient for a given pseudo Reynolds number and free area ratio as in Fig. 7, the minimum resistance for the standard louver is less than that for the diffuser-section louver. However, at high width coefficients the diffuser-section louver has less resistance than that of the standard louver.

The effect of the diffuser angle on louver performance is shown in Fig. 8.

Nozzle-Section Louvers: The results of tests on the nozzle-section louvers are shown in Fig. 9. The curves indicate that the width and free area ratio of nozzle-section louvers do not appreciably affect the resistance coefficient. Apparently the flow conditions are improved owing to the shape of the entrance section by an amount such that only a minor recovery occurs by adding to the width or spacing of the boards.

It is seen by comparing the results of the standard louver and nozzle-section louver tests that the resistance coefficient for a nozzle-section louver of a given free area ratio and width of louver board is approximately one-half that of the standard louver.

Inverted Louvers: The curves of Fig. 10 show the performance characteristics of inverted louvers having zero overlap of the louver boards.

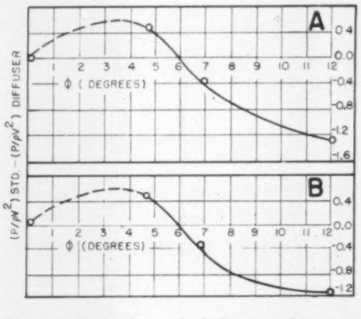

Fig. 8—Variation of difference between resistance coefficients for standard louver and diffuser-section louver with diffuser angle. Pseudo Reynolds number $[dv\rho/\mu\ (10^{-3})] = 4000$ at A, and 8000 at B. $\theta = 45$ deg, all cases

The figure contains three major groups of curves, each for a different value of s/L' corresponding to slope angles of 30, 45 and 60 deg. Within each group individual curves correspond to different constant values of free area ratio and also different board widths. Changing the board width with changes in spacing or angle of slope was necessary in order to maintain zero overlap.

These curves show that as s/L' increases, that is, as the approach angle increases, the free area ratio becomes more significant as indicated by the wider spread of the resistance coefficient. Apparently, as the angle increases, the turbulence immediately downstream from the entrance edge of the louver board increases, but the overall resistance is diminished by increasing the spacing and also the width of the louver board, thus accounting for the greater significance of the free area ratio revealed by the curves.

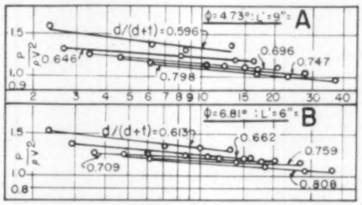

Fig. 9—Variation of resistance coefficients $(P/\rho v^2)$ with pseudo Reynolds number $[dv\rho/\mu\ (10^{-3})]$ for different values of free area ratio. Nozzle-section louvers with $\theta = 45$ deg, all cases

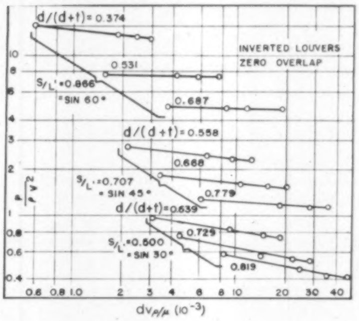

Fig. 10—Variation of resistance coefficient with pseudo Reynolds number for different values of free area ratio and s/L' (inverted louvers)

If the 45-deg inverted louver is compared with the 45-deg standard louver of the same free area ratio and approximately the same width, it is seen that the resistance coefficient of the inverted louver is about 40 percent less than that of the standard louver. These louvers were made from exactly the same boards, the only difference being that in one case the boards were assembled with their beveled edges in a vertical plane, whereas in the second case (inverted louvers) the beveled edges were horizontal, that is, parallel to the direction of air flow. The major difference here is that the inverted louvers were arranged to give better entrance conditions.

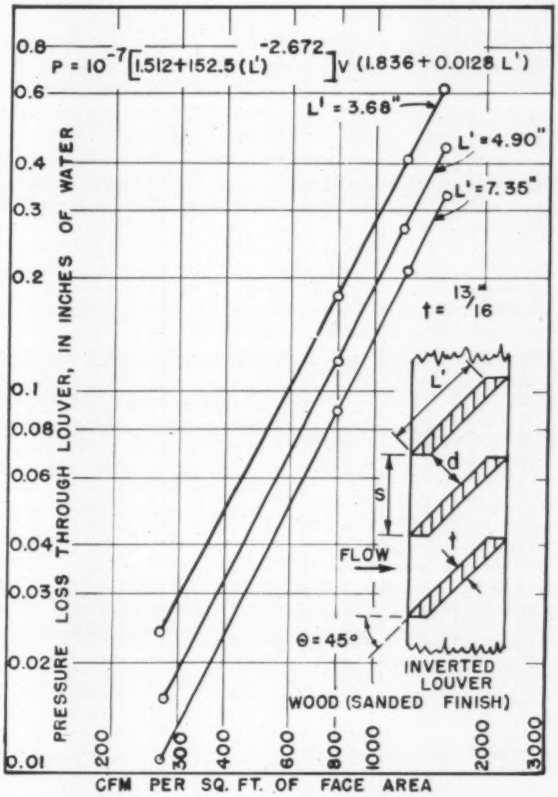

Fig. 11—Variation of pressure loss through louver with face velocity for different values of the width

In view of the better performance of the inverted louver, it seems that this type louver should be more desirable in installations where pressure loss is a decisive factor.

The results of the inverted louver investigation are presented here in graph form, using as parameters the several dimensionless coefficients, as explained in the Appendix, in order to make them apply generally to a wide variety of applications. Other coordinates might have been used, but with the loss of generality. For example, in Fig. 11 pressure drop in inches of water for the inverted louver of 45 deg slope is plotted against cfm per sq ft of face area for three different board widths in inches. The equation of the family of curves was found to be

$$P = [1.512 + 152.5(L')^{-2.672}]\,10^{-7}v^{(1.836\,+\,0.0128L')}$$

The range of values of L' and v were 3.68-7.35 in. and 250-2000 cfm respectively. The equation should not be used for values of the variables very much outside these ranges. Also, neither the curves nor the equation take into consideration variations in air density or viscosity. For the tests from which this equation was derived, the range in air density was 0.07055-0.7231 lb_m/ft^3 and in viscosity it was 124.1-126.1 $\text{lb}_m/\text{ft-sec}$. However, for many louver applications the density and viscosity of the air may not differ appreciably from these values, and the equation may apply. For applications where the above assumptions are not valid the curves of Fig. 10 should be used.

References

1. Pressure Loss of Air Flowing through 45-Degree Wooden Louvers, by P. R. Cobb (ASHVE JOURNAL SECTION, *Heating, Piping & Air Conditioning, December* 1953, p. 123).

2. Private communication with W. W. Smith, Texas Engineering Experiment Station, A. & M. College of Texas. The statement was based on model studies conducted by Professor Smith for the Texas Engineering Experiment Station in connection with cooling tower research.

3. Standard Test Code for Centrifugal and Axial Fans (*National Association of Fan Manufacturers, Inc.*, Bulletin No. 110, Second Edition, 1952).

4. Determination of Air Infiltration in Fan Testing Equipment, by W. D. Scoates (Research Report No. 40, Texas Engineering Experiment Station, A. & M. College of Texas).

APPENDIX

The current formulation of fluid resistance is based on a modification of Newton's equation and may be represented by $D = \text{Drag} = f(R)\ A\rho v^2$, where $f(R)$ is a function of Reynolds number and varies for each shape and position of the body. This equation thus takes into consideration pressure differences, frictional stresses within the fluid, and the resistance, drag, or frictional effect of the fluid flowing around the body. Therefore, $f(R)$ must be determined by experiment.

Specifically, it was attempted to analyze various shapes and arrangements of louver boards according to the principles of similarity and dimensional analysis, to find by experiment the value of the various factors or dimensionless groups which characterize a given arrangement, and to present the results in a manner useful for the solution of practical design problems.

Analysis of Problem

Variables considered in applying the method of dimensional analysis to the louvers used in this investigation are as follows:

P = pressure loss through the louver, inches of water.
v = velocity of the air in the approach duct (cfm/ft^2 of face area of the louver), feet per minute.
ρ = density of the air, pounds mass per cubic foot.
μ = viscosity of the air, pounds mass per foot per second.
d = perpendicular distance between louver boards, inches.
s = distance between louver boards at entrance face of louver, inches.
t = thickness of louver board, inches.
L' = width of louver board, inches.
L = length of louver board, inches.

These variables can be organized into six dimensionless groups. One of these groups, namely, $dL/2\ (L-d)$, can be neglected for small values of d, since, when d is small, this quantity takes on the value, $d/2$. The remaining dimensionless groups are:

$dv\rho/\mu$ = pseudo Reynolds number[*].
$P/\rho v^2$ = resistance coefficient.
L'/s = width coefficient.
$d/(d+t)$ = free area ratio.
d/s = angle coefficient.

For the condition of zero overlap it may be shown that one of the three dimensions d, s, or L' is not an independent variable because given any two of the three variables the third is fixed. One of these variables may thus be eliminated in considering this type of louver. The choice made was to eliminate the angle coefficient d/s, thus giving four dimensionless groups for this type of louver.

Calculations

The following formula was used to calculate air velocity from Pitot tube readings.

$$v' = 1096.5\sqrt{\frac{h_v}{\rho}}$$

in which

v' = velocity of air at point of measurement, feet per minute.
h_v = velocity pressure, inches of water.
ρ = density of air, pounds mass per cubic foot.

Essentially the same formula was used for the nozzle except that it was necessary to include a nozzle discharge coefficient and a correction factor for approach velocity.

The nozzle discharge coefficient was obtained from an alignment chart made by the Texas Engineering Experiment Station, and based on *ASME Transactions.*

The approach velocity correction factor was obtained from the relation

$$C = \frac{1}{\sqrt{1-\left(\frac{A_n}{A_D}\right)^2}}$$

in which A_n is the throat area of the nozzle, and A_D is the area of the duct.

The volume of flow was determined by the expression $Q = Av'$, in which A equals A_n for the nozzle and A_D for the Pitot tube.

The average velocity on the inlet side of the louver was then obtained from $v = Q/A_e$, in which A_e is the cross-sectional area of the entrance duct.

The density of the air was obtained from an Air Density Calculator designed by the Texas Engineering Experiment Station. This calculator is a slide rule device which gives air densities for different dry-bulb and wet-bulb temperatures and barometric pressure.

The viscosity of the air was obtained from a graph plotted from data given in published tables.

The calculation of the dimensionless groups, $dv\ \rho/\mu$ and $P/\rho v^2$, required the use of several conversion factors because of the inconsistent units of the variables, P, v, d, ρ, and μ. The group $dv\rho/\mu$ has the units, $\mathrm{ft^2\text{-}in.\text{-}lb_m\text{-}sec/min\text{-}ft^3\text{-}lb_m}$. To make this group unitless, the necessary conversion factor was obtained as follows:

$$\begin{aligned} dv\rho/\mu &= (\mathrm{ft\text{-}in.\text{-}lb_m\text{-}ft\text{-}sec/min\text{-}ft^3\text{-}lb_m}) \\ &\quad (\mathrm{min}/60\ \mathrm{sec})\ (\mathrm{ft}/12\ \mathrm{in.}) \\ &= (\text{calculated units})\ (1/720) \\ &= (\text{calculated units}) \\ &\quad (.0013889). \end{aligned}$$

To make the group $P/\rho v^2$ unitless, the necessary conversion factor was found in a similar manner as shown below.

$$\begin{aligned} P/\rho v^2 &= (\mathrm{in.\ of\ water\text{-}ft^3\text{-}min^2/lb_m\text{-}ft^2}) \\ &\quad (g\ \mathrm{ft/sec^2})\ (62.3\ \mathrm{lb_m/ft^3}) \\ &\quad (\mathrm{ft}/12\ \mathrm{in.})\ (3600\ \mathrm{sec^2/min^2}) \end{aligned}$$

in which g is the local acceleration of gravity or approximately 32.11 ft/sec^2 in the College Station, Texas area.

Hence

$$\begin{aligned} P/\rho v^2 &= (\text{calculated units})\ [(32.11) \\ &\quad (62.3)\ (3600)/12] \\ &= (\text{calculated units})\ (600{,}140). \end{aligned}$$

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[*] The term pseudo Reynolds number is used here because this group is not a ratio of inertia forces to viscous forces, but rather a function of this ratio. The approach velocity was used because it is common to all of the louvers, is easy to measure, and is related to the velocity within the louver by the continuity equation. If the velocity within the louver were used in place of the approach velocity, it would be necessary to state at what position in the louver this velocity corresponds because this velocity varies (except in the standard louver) throughout the louver. Another alternative is to use the velocity at the position in the louver where d is measured. Using this velocity, v', in the $dv\rho/\mu$ term results merely in a product of two dimensionless groups, namely $(dv\rho/\mu)\ (v'/v) = (dv\rho/\mu)\ (A/A')$ = (pseudo Reynolds number) (1/Free Area Ratio) $= dv'\rho/\mu$ so that no new variables have been introduced. It is true that using the $dv'\rho/\mu$ term tends to cause the curves to fall on top of each other, but not to such an extent that a single curve could be used without appreciable error.

THE PRESIDENT'S PAGE

Our School System

EACH year our school systems in the United States and Canada are falling behind classroom demand by 70,000 units. That means that every 15 min we have two fewer classrooms than we need.

And it means that damage to our nation's economy can be measured in quarter-hours because the children of today are the engineers, teachers, and merchants of tomorrow. Poorly trained personnel means a real loss in the growth and progress of our heating and air-conditioning industry as well as our nation.

This year there are 40 million boys and girls in school and nearly one million are attending only half time because of classroom shortages. Seven million are going to school in firetraps and 3½ million of the elementary students are in buildings more than 50 years old.

The latest figures available in the United States indicate a national classroom shortage of about 370,000, but a new U.S. Office of Education report, soon to be issued, will raise the official estimate to more than a half million.

We have 70 percent more children under five years of age than we had 15 years ago, and by 1960 there will be about 48 million students in the United States and Canada. How will these eight million more fare by 1960? We will need approximately 700,000 new elementary and secondary school classrooms during the next five years.

The answer is not very reassuring in view of the currently modest school construction programs. And there are other serious shortcomings that will work adversely on our national economies for years to come.

There is a shortage of financial and social reward for teaching. Most damaging of all, there is a shortage of top caliber teachers. This is especially true of teachers in mathematics, physics, chemistry and other subjects leading to an engineering career, for less than 3 percent of graduates in engineering enter the teaching profession.

We have at least 170,000 too few teachers and more and more are being driven out of the profession by low pay and unfounded criticism. The number of new science teachers has decreased more than 50 percent since 1950 while the need rapidly increases.

Who, except the most devoted teachers, will indefinitely put up with overcrowded classes and the inadequate pay checks found in some communities?

In order to understand the problem fully we must recognize that the teaching profession does not have the status, the respect and the honor from the public it richly deserves.

What then, can we do?

We can act to provide school facilities that grow with the demand. We can see that the teacher's pay is in keeping with the trusted station to which he, or she, often dedicates a lifetime.

Only such conditions will attract the bright young people acutely needed in increasing numbers to teach our growing school population.

What is a good concrete way to begin? As citizens, parents, and individuals we can:

1. Inform ourselves of school conditions in the communities where we live and where we work.
2. Become active in Parent-Teachers Associations, support or serve on school boards, and work to see that needed school bond issues are understood and supported by the community.
3. Support institutions of higher learning as well as grade and high schools.
4. Be certain that when a school is built, the proper environment is provided by means of adequate heating, ventilation, lighting, and other mechanical facilities.

The Society and the Society Chapters cannot engage in political lobbying or in legislative activities, but when specifically invited we can and should give technical advice on codes or wherever this advice will benefit the community and the general public.

When we do these things we are helping provide needed protection for the present of education — and the future of our two nations.

J. E. Haines

President

AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS

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Committee on Arrangements

SEMI-ANNUAL MEETING

June 27-29, 1955

San Francisco, Calif.

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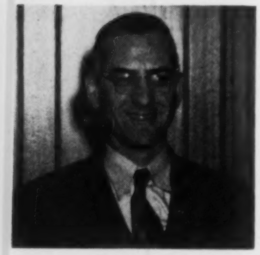

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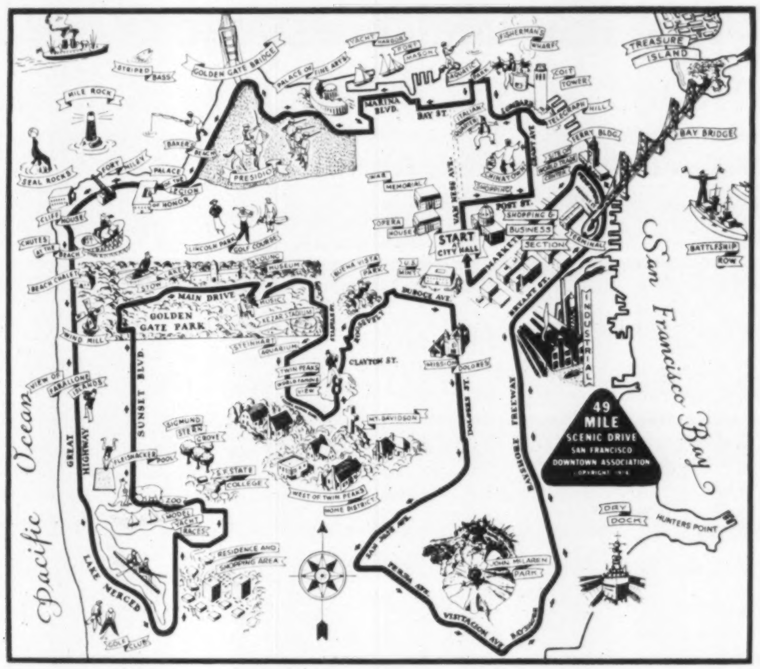
Golden Gate Bridge
Striped Bass
Mile Rock
Seal Rocks
Cliff House
Chutes at the Beach
Beach Chalet
Wind Mill
Palace of Fine Arts
Yacht Harbor
Fort Mason
Fisherman's Wharf
Treasure Island
Coit Tower
Telegraph Hill
Ferry Bldg
Bay Bridge
Battleship Row
Marina Blvd.
Bay St.
Presidio
Palace Legion of Honor
Lincoln Park Golf Course
Main Drive
Golden Gate Park
War Memorial
Opera House
Van Ness Ave.
Chinatown
Post St.
Shopping & Business Section
Start City Hall
Buena Vista Park
Duboce Ave
Clayton St.
Twin Peaks
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Great Highway
Sigmund Stern Grove
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Zoo
S.F. State College
West of Twin Peaks Home District
Lake Merced
Golf Club
Residence and Shopping Area
Industrial
Bayshore Freeway
John McLaren Park
Dry Dock
Hunters Point
Pacific Ocean
San Francisco Bay
49 MILE SCENIC DRIVE SAN FRANCISCO DOWNTOWN ASSOCIATION

Places to visit in and about San Francisco

On To San Francisco!

As THE DATE of the 1955 Semi-Annual Meeting of the Society draws closer the interest of the membership is increasing and many are already making plans to travel by air, rail or car and vacation in San Francisco while attending the meeting June 27-29 at the St. Francis Hotel.

The Committee on Arrangements, under the general chairmanship of S. W. Terry, has been working industriously, and from all reports an excellent program of technical sessions and social events has been planned for the visiting ASHAE members and their families.

Four technical sessions are planned for Monday, Tuesday and Wednesday with papers for presentation on such subjects as a comparison of the performance of indirect water heaters, the resistance of wooden louvers to fluid flow, air conditioning coil odors and a method for determining winter design temperatures. Additional papers will offer information on the ventilation of commercial laundries, and an index for evaluating heat stress in terms of the resulting physiological strains.

On the lighter side there will be a golf tournament on Monday afternoon at the Lakeside Club for the new Research Bowl, the Eichberg Memorial Cup and the Paul Bunyan Cup. Wednesday evening Dr. A. M. Zarem, manager, Southern California Division, Stanford Research Institute, will be the guest speaker at the banquet which will be held in the Colonial Room of the St. Francis Hotel. The subject of Dr. Zarem's address will be Smog — A Challenge to Technology, and he will be introduced by Dr. B. M. Woods, past president of ASHAE and vice president, University Extension, University of California, who will serve as toastmaster.

In addition there will be planned activities for the ladies such as conducted tours to many of the points of interest in San Francisco. Among the places to see are Fisherman's Wharf, Muir Woods, Golden Gate Park and San Francisco's Chinatown.

TYPICAL AIRLINE AND RAILROAD RATES BETWEEN SAN FRANCISCO AND CHAPTER CITIES

(All fares subject to 10% Federal Tax)

Airline

	Round Trip
Atlanta, Ga.	$263.70
Boston, Mass.	318.40
Buffalo, N. Y.	273.10
Chicago, Ill.	218.10
Cincinnati, Ohio	244.10
Cleveland, Ohio	254.20
Dallas, Texas	186.10
Denver, Colo.	123.70
Detroit, Mich.	247.00
Houston, Texas	209.40
Los Angeles, Calif.	41.90
Memphis, Tenn.	228.50
Milwaukee, Wisc.	218.10
New Orleans, La.	244.00
New York, N. Y.	301.90
Omaha, Neb.	181.60
Philadelphia, Pa.	293.40
Portland, Ore.	66.80
St. Louis, Mo.	206.30
Salt Lake City, Utah	79.20
Seattle, Wash.	82.70
Toronto, Ont., Canada	273.20
Washington, D. C.	283.80

Railroad

	Round Trip First Class	One Way Lower Berth Pullman
Atlanta, Ga.	$146.00	$23.30
Boston, Mass.	214.91	29.60
Buffalo, N. Y.	171.50	25.65
Charlotte, N. C.	164.05	27.65
Chicago, Ill.	126.45	21.00
Cincinnati, Ohio	143.90	23.30
Cleveland, Ohio	156.60	23.90
Dallas, Texas	106.05	17.55
Denver, Colo.	80.65	15.40
Detroit, Mich.	151.90	23.90
Grand Rapids, Mich.	143.13	21.00
Houston, Texas	106.05	17.55
Kansas City, Mo.	103.35	18.10
Los Angeles, Calif.	30.40	5.00
Memphis, Tenn	119.65	19.60
Milwaukee, Wisc.	126.45	21.00
Minneapolis, Minn.	123.40	21.00
New Orleans, La.	119.65	19.00
New York, N. Y.	202.73	28.90
Oklahoma City, Okla.	103.35	17.55
Omaha, Nebr.	103.35	18.10
Pittsburgh, Pa.	166.95	24.95
Portland, Ore.	47.65	8.30
St. Louis, Mo.	119.65	20.15
Salt Lake City, Utah	50.00	8.90
Seattle, Wash.	58.30	9.95
Toronto, Ont., Can.	168.35	26.80
Washington, D. C.	187.05	27.30

PROGRAM — 1955 SEMI-ANNUAL MEETING

AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS

June 27-29, 1955

St. Francis Hotel, San Francisco, Calif.

All Functions on Pacific Daylight Saving Time

Sunday — June 26

- 9:30 a.m. COUNCIL MEETING — *Room 220*
- 10:00 a.m. REGISTRATION — *Green Room*
- 3:30 p.m. WELCOME TEA (Sacramento Chapter, Hosts)

Monday — June 27

- 9:00 a.m. REGISTRATION — *Green Room*
- 9:30 a.m. FIRST TECHNICAL SESSION — *Italian Room*
  - Call to Order by Pres. John E. Haines
  - Welcome by D. E. McLeod, Vice President, Golden Gate Chapter
  - Electric Analogue Prediction of the Thermal Behavior of an Inhabitable Enclosure, by Harry Buchberg
  - A Method for Determining Winter Design Temperatures, by M. K. Thomas
  - Periodic Heat Flow Through Flat Roofs, by D. J. Vild, M. L. Erickson, G. V. Parmelee and A. N. Cerny
- 12:30 p.m. WELCOME LUNCHEON — *Colonial Room*
- 1:00 p.m. Golf tournament — *Lakeside Club*
- 2:00 p.m. Sightseeing Trip — Scenic Boat Ride on San Francisco Bay
- 7:00 p.m. "Forty-niner" Get-Together Party — *Surf Club* at Beach

Tuesday — June 28

- 9:00 a.m. REGISTRATION — *Green Room*
- 9:30 a.m. SECOND TECHNICAL SESSION — *Colonial Room*
  - Call to Order by Vice Pres. John W. James
  - Ventilation of Commercial Laundries, by Sidney Marlow
  - Air Conditioning Coil Odors, by A. B. Hubbard, Nicholas Deininger and Frederick Sullivan
  - Size Distribution and Concentration of Air-borne Dust, by K. T. Whitby, A. B. Algren and R. C. Jordan
- 10:30 a.m. Sightseeing Trip: Golden Gate Bridge, Muir Woods
- 1:30 p.m. Sightseeing Boat Trip in Bay; Chinatown Trip
- 6:00 p.m. Informal Dining at Fisherman's Wharf, International Settlement, other famous restaurants
- 8:45 p.m. San Francisco Night Club Tour

Wednesday — June 29

- 9:00 a.m. REGISTRATION — *Green Room*
- 9:15 a.m. Ladies Continental Breakfast — *Mural Room*. Conducted Tour of Stores followed by Luncheon in Chinatown.
- 9:30 a.m. THIRD TECHNICAL SESSION — *Colonial Room*
  - Call to Order by Second Vice Pres. P. B. Gordon
  - Sources of Vent Gas in a Hot Water Heating System, by L. N. Montgomery and W. S. Harris
  - Psychrometric Analysis for Design of Forced Draft Cooling Towers, by S. E. Agnon and B. H. Spurlock, Jr.
  - Resistance of Wooden Louvers to Fluid Flow, by C. W. Bevier
  - Performance and Evaluation of Room Air Distribution Systems, by Alfred Koestel and G. L. Tuve.
- 10:00 a.m. Ladies and Children Sightseeing and Luncheon: Golden Gate Park, Aquarium, Zoo and Ocean
- 2:00 p.m. EVAPORATIVE COOLING SYMPOSIUM
  - W. T. Smith, Chairman
  - Historical — R. M. Phillips
  - Air Cooling by Evaporation — S. F. Duncan
  - Evaporation from Surfaces — R. J. Petersen
  - Weather Data Limitations — Stuart Giles
  - Geographical Limitations — Robert Ash
  - System Design — Richard Hukill
  - Indirect Systems — D. T. Robbins
  - Water Treatment — R. M. Westcott
  - Discussion Period
  - Report of Committee on Resolutions
  - Unfinished Business
  - New Business
  - Adjournment
- 6:30 p.m. Social Hour — *Italian Room*
- 7:00 p.m. SEMI-ANNUAL BANQUET — *Colonial Room*
  - *Toastmaster*: Dr. Baldwin Woods, Past President. Vice President, University Extension, University of California
  - Award of Golf Trophies
  - *Speaker:* Dr. A. M. Zarem, Manager, Southern California Division, Stanford Research Institute
  - *Subject:* Smog — A Challenge to Technology
  - Dancing

Method of Choosing Location of, Financing and Conducting Meetings of the Society

Resolved: That inasmuch as the Annual and Semi-Annual Meetings of the Society come under the jurisdiction of the Council, the following rules governing the handling of such meetings be adopted by the Council and published in the JOURNAL of the Society at least twice during every year, preferably just prior to each meeting.

1—The Council will select the city in which the Annual or Semi-Annual Meeting is to be held, giving due consideration to the invitations received from Chapters or members as well as to the advisability of so distributing those meetings as to make them of the greatest advantage to the general membership, and to reduce as far as possible the expense of members attending.

2—That an appropriation be made to cover the entertainment or local expenses, incurred in connection with the meeting, and the regular meeting expenses to be taken care of by the General Fund of the Society in the regular way.

3—That no registration fee or compulsory obligations of any nature be imposed on members or guests.

4—That the purchase of tickets for banquets or for any other form of entertainment that may be provided be entirely voluntary.

5—That the grouping of features and the sale of tickets for group features be discouraged.

6—That the raising of funds from manufacturers of heating apparatus be discouraged.

7—That the display of samples, or of literature, advertising the product of any manufacturer in any way, shape or form, be not permitted at the booths, registration desk, or in or about the meetings.

8—That the distribution of trade papers be entirely at the discretion of the committee in charge.

9—That the local Chapter or local members be empowered to form a General Committee with such sub-committees as may be required to handle the details of transportation, hotel accommodations, entertainment, finance, etc., and that this General Committee be requested to confer frequently with the Council, through the Executive Secretary of the Society, and to make frequent reports on progress in connection with the various matters being handled by them.

10—That the arrangements of elaborate and costly entertainment features be discouraged.

Adopted at Council Meeting, January 29, 1926.

An Analysis Method for Predicting Behavior of Solid Adsorbents in Solid Sorption Dehumidifiers

By W. L. Ross* and E. R. McLaughlin, University Park, Pa.**

This paper is the result of research sponsored by the American Society of Heating and Air-Conditioning Engineers, Inc., in cooperation with The Pennsylvania State University, University Park, Pa.

THE OBJECTIVE of this paper is to present a method for predicting behavior characteristics of dynamic adsorption systems. Specifically, it aims at enabling the dehumidification machine designer, manufacturer or user to estimate the effect of changes in operating conditions on adsorption and desorption characteristics. The method is empirical in that test data from the system in question must be used in the formulation of the prediction equations, and the method is approximate in that certain mathematical assumptions are made to preclude the necessity of conducting an extremely large number of tests to obtain a complete picture of the variation of the adsorption characteristics (such as breakpoint useful concentration) with the primary variables (such as temperature and relative humidity of the flowing air).

It is realized that these assumptions impose limitations on the prediction technique. It is felt, however, that the savings in labor and time, as well as the increase in utilitarian value which results from these assumptions, serve to justify them, especially in this particular field where no behavior prediction method has yet been evolved, and where, because of the very large number of variables involved and the difficulty in getting experimental reproducibility, an approximate solution is all that presently can be hoped for.

Before proceeding with the analysis method, the so-called adsorption and desorption characteristics will be described and defined as they relate to dynamic dehumidification.

SUMMARY — Owing mainly to the large number of variables involved in dynamic adsorption, relatively little information is available concerning the engineering design and characteristics of such systems. An empirical method is presented here for predicting characteristics of an adsorbent under typical commercial operating conditions. Based on a number of experimental tests conducted under a prescribed test schedule, this technique permits approximate prediction of adsorbent behavior for various combinations of inlet conditions. The derivation of one of the design equations is detailed, and eight others are presented for estimating such factors as completion time, breakpoint time, adsorption efficiency and economy of desorption. These equations are based on a silica gel-water vapor dynamic system, but the analysis method itself is applicable to other systems. Sample problems are solved.

Characteristics and Definitions

The only requisites for a dynamic dehumidifier are a desiccant bed, a fan to force the humid air through this bed and a heater to periodically reactivate the adsorbent. As the air passes into the activated desiccant, it surrenders a certain amount of its water vapor. The rate of moisture pickup and the humidity condition of the leaving air are functions of a great many variables, some of which will be discussed later. The ratio of the amount of water adsorbed by the desiccant in a given time to the amount of water vapor in the air entering the desiccant bed during that time is known as *adsorption efficiency*. A characteristic of adsorbents in dynamic use is that this adsorption efficiency remains constant and at a relatively high level from the beginning of an adsorption cycle until some later point in the cycle at which time the efficiency begins to drop. This point is known as the *breakpoint*, and the time from the beginning of adsorption to this point is known as the *breakpoint time*. In the ideal case the breakpoint would coincide timewise with the sudden upswing of the effluent dew-point temperature. Although additional drying can be effected beyond the breakpoint, good commercial practice dictates that the gel be regenerated in the near vicinity of this point. Adsorption carried beyond the breakpoint continues at an increasingly slower rate until the adsorbent is completely saturated. This point is known as *completion*.

Adsorbents, such as silica gel and activated alumina, contain, even when reactivated, a small amount of water. This is usually about 5 to 7 percent of the dry weight of the desiccant and is known as residual moisture. Attempts to remove it result in a physical change in the substance and a reduced adsorptive capacity. The term *useful concentration* is used to designate the percent of moisture in the adsorbent over and above the residual quantity. This percentage is generally based on the dry weight of the desiccant.

When regeneration of the adsorbent is desired, the heater is energized and the direction of air flow through the bed is usually reversed. The effluent dry-bulb temperature rises rapidly at first, and then virtually levels off for a period of time. This period of level or slowly increasing temperature represents the period during which the major portion of the heat input is being used to boil off the adsorbed water. This temperature pattern continues until most of the water contained in or on the desiccant is released. Then, when the latent heat requirements begin to diminish, the heat input goes into sensible heat gain to the passing air stream. This is reflected in a rather sharp increase in the effluent dry-bulb temperature. This point, measured from the beginning of desorption, has been designated *temperature-rise time*. Although additional regeneration (at a slower rate) can be attained by continuing the heat addition process beyond the temperature-rise time, once again good commercial practice calls for reactivation to be ended in the near vicinity of this point. Regeneration past this point until the adsorbent is in moisture equilibrium with the air stream is known as *complete desorption* or *desorption to completion*. The energy expended in the heater per unit weight of water desorbed for any given time is called *economy of desorption* and usually has the dimensions of kwhr/lb of water desorbed.

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*Assistant Professor, Mechanical Engineering Department, The Pennsylvania State University.

**Associate Professor, Department of Engineering Research, The Pennsylvania State University.

Presented at the Oklahoma Regional Meeting of the American Society of Heating and Air-Conditioning Engineers, Inc., Oklahoma City, April 1955.

Objectives of Analysis Method

These two processes, dynamic adsorption and dynamic desorption, which have just been briefly outlined, are extremely difficult to analyze or predict, because they are transient and because they are functions of a great number of variables. Notable analytical work has been done both theoretically and empirically on adsorption and related phenomena, and almost all of this has appeared in chemical literature.

Although most engineering operations involving desiccants are of the dynamic and near-adiabatic variety, there is no accepted analysis method, to the knowledge of the authors, for predicting the behavior characteristics of desiccants under these conditions. In approaching the problem of evolving such a method for consideration, it was necessary to define the objectives desired and to evaluate properly the following observations:

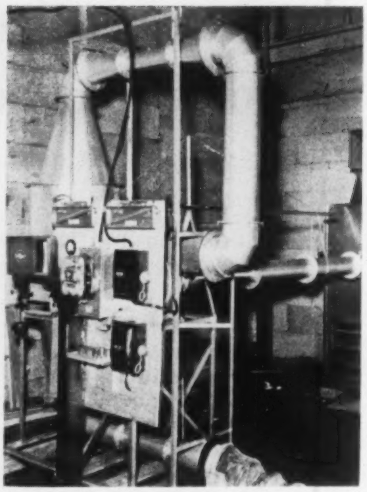

Fig. 1—Test equipment

1. All purely theoretical analyses to date have been handicapped by a multitude of simplifying assumptions, by assumptions as to the mechanism of adsorption, by not accounting for the possibility of more than one such mechanism, by insurmountable, or at best, extremely tedious, mathematical obstacles.
2. For engineering application a theoretical analysis is not requisite, nor, in some cases, even desirable.
3. The empirical approaches have necessarily been restrictive in range of operating conditions, as well as in applicability to specific adsorbents and adsorbates.
4. In no known case does either a theoretical or an empirical method of analysis enable the engineer to predict many of the design factors he most wants, such as adsorption efficiency, breakpoint time and cost of operation.
5. Numerous past experiments carried out in chemical laboratories by competent investigators using precision equipment have, unfortunately, made evident the fact that the variables involved are so numerous and the adsorbents themselves so inconsistent that close experimental reproducibility is seldom achievable. Because of the type and size of the equipment and the operating conditions, engineering tests are likely to be even less accurate. Also, laboratory-type experimental results are not necessarily valid for engineering application.

Table 1—Nominal Values of Test Variables
(Face velocity in fpm equals cfm/2)

Test Variables	Nominal Values
Room Dry-Bulb Temperature, F	40, 70[a], 100
Room Relative Humidity, percent	20, 35[a], 55, 90
Bed Thickness, inches	2, 4[a], 8
Adsorption Air Flow, cfm	60, 110[a], 170, 240
Reactivation Air Flow, cfm	50, 62.5, 67.5, 90, 112.5[a], 125
Heater Power, watts	2000, 2500, 4500[a], 5000
Cfm per Watt	0.015, 0.020, 0.025[a]

[a] Chosen *standard* values.

In the light of the aforementioned considerations a new analysis method should be, first, utilitarian both in relative ease of use and in telling the engineer what he wants to know (even if at a sacrifice of mathematical or physical rigor), and secondly, it should be based on engineering-type experimental results and applicable in principle to any adsorbent-adsorbate combination for which suitable data are available.

Premises of Proposed Method

The proposed prediction method is based on the following premises:

1. That the adsorption characteristics desired are (a) completion useful concentration, (b) breakpoint useful concentration, (c) complete adsorption time, (d) breakpoint time and (e) adsorption efficiency to breakpoint.
2. That these five adsorption characteristics are, for a given system, primarily a function of the dry-bulb temperature and relative humidity of the air entering the bed, the rate of air flow and the bed-depth to bed-diameter ratio.
3. That the desorption characteristics desired are (a) completion useful concentration desorbed, (b) complete desorption time, (c) temperature-rise time and (d) economy of desorption to temperature-rise.
4. That these four desorption characteristics are, for a given system, primarily a function of the dry-bulb temperature and relative humidity of the air entering the bed, the rate of air flow per unit of heater output, the bed-depth to bed-diameter ratio, and the heater wattage.

Then, in general notation,

$$X = f\,(Y_1, Y_2, Y_3 \ldots Y_n) \ldots \text{(A)}$$

from which it is assumed that the functions are such that

$$\begin{aligned} dX = {} & (\delta X/\delta Y_1)\ dY_1 \\ & + (\delta X/\delta Y_2)\ dY_2 \\ & + (\delta X/\delta Y_n)\ dY_n \ldots \text{(B)} \end{aligned}$$

where

X = desired adsorption or desorption characteristic.

$Y_1, Y_2,$ etc. = factors on which X is primarily dependent.

Now, by following a test procedure in which standard values are chosen for each primary variable and in which all variables except one are held at their standard values for any given test, it is possible to experimentally determine functions for the parenthetical partial differential terms in Equation B. In other words, if X is plotted against Y_1, the data being obtained from tests in which Y_2,

Y_3, .. Y_n were held at their standard values, a curve results which can be put into equation form and which, in turn, can be differentiated, with respect to Y_1, to yield $(\delta X/\delta Y_1)$.

Using this technique for each of the primary variables involved, an expression for dX is obtained. Assuming this to be integrable, the resulting expression for X will contain a constant of integration for each of the primary variables.

Actually, this so-called integration constant can, for a given variable, be either a pure constant, zero-valued, or some function of the other variables involved. The analysis method being proposed uses the assumption that the sum of the integration constants for each differential equation can, over a limited range of primary variable variation, be approximated by a pure constant, this constant being determined from the experimental data. This assumption has two basic and opposite ramifications; first, it renders the technique practical in that it enables the derivation of empirical prediction equations based on data from relatively few experimental tests; secondly, it imposes the most severe limitation on the efficacy of the results by not fully accounting for the intervariability of the primary variables. Because of the effects of this assumption, the *standard value* of each variable should be chosen at or near its normal or typical design level, and this should be in the vicinity of the middle of its test range. Similarly, it should be realized that reliability of prediction will generally decrease as the primary variables used in the prediction equations digress from their standard values.

Method Applied to Test Data

The analysis method, having been explained in general notation, will now be further illustrated by applying it to actual test data. Although the method itself is universally applicable, it must be emphasized that the prediction equations that are evolved are for a particular adsorption system and must necessarily be based on a certain minimum amount of data from that system. In other words, the ultimate results achieved from data for a water vapor-activated alumina system will be different from the results reached through data from a water vapor-silica gel system, even though the same general technique is used in arriving at these results. There also would be differences in final prediction equations for widely different adsorption (or dehumidification) machines even though the same adsorbent-adsorbate combinations were used in each.

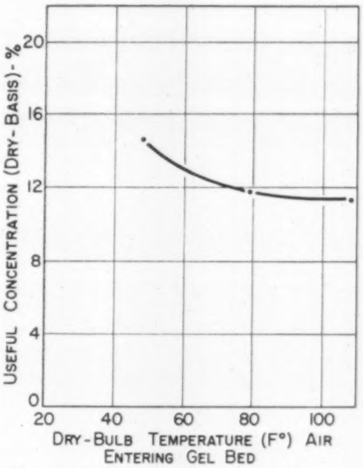

Fig. 2—Effect of inlet temperature on useful concentration

The data used in the analysis application to follow were obtained using commercial grade, 6-16 mesh silica gel as adsorbent and air-borne water vapor as adsorbate. The adsorption machine (desiccant tester, in this case) is shown in Fig. 1. It was designed to be as simple structurally and functionally as possible so that there would be a minimum of outside influence on the behavior of the adsorbent under test. The desiccant bed was round with a cross-sectional area of 2 sq ft, and air flow was axial.

Nomenclature

B = depth-to-diameter ratio of adsorbent bed.
C = air flow, cubic feet per minute.
C_W = air flow to heater wattage ratio, cubic feet per minute per watt.
E_B = adsorption efficiency to breakpoint, percent.
G = dry weight of adsorbent, pounds.
K = constant.
L = depth of adsorbent bed, inches.
M_R = economy of desorption to temperature-rise, kilowatt hours per pound of water desorbed.
R = relative humidity of air entering bed, percent.
T = dry-bulb temperature of air entering bed, Fahrenheit degrees.
t_B = breakpoint time (adsorption), minutes.
t_D = completion time (desorption), minutes.
t_R = temperature-rise time (desorption), minutes.
U_B = useful concentration at breakpoint, percent.
U_C = useful concentration at completion (adsorption), percent.
U_D = useful concentration desorbed, percent.
V = face velocity of air stream, feet per minute.
W = heater wattage.

A total of 24 tests was conducted, 11 adsorption and 13 desorption. In every case all primary variables except one were held at their respective *standard* values for a given test. Conditions were near-adiabatic in that no after-cooling was employed. All tests were continued to completion. The air temperature entering the bed averaged 8-10 deg higher than room temperature, owing to a sensible heat gain through the fan.

A detailed description of the desiccant tester, test schedule (Table 2), procedure and experimental data will not be recounted here. This information is on file at the Main Library, The Pennsylvania State University[1] and at the Research Laboratory of the American Society of Heating and Air-Conditioning Engineers.

The method of obtaining an approximate prediction equation which has just been described in general terms will now be illustrated using completion useful concentration (adsorbed) as the desired characteristic of the dynamic system. Figs. 2-5 were plotted from the test results, and Equations 1-4 are analytical approximations to the curves shown in these figures. See Nomenclature for definition of the symbols used.

From Fig. 2,

$$U_c = -0.714\,T + 0.0076\,T^2 - 0.00002741\,T^3 + 34.24 \quad \ldots\ldots\ldots (1)$$

From Fig. 3,

$$U_c = 0.505\,R \quad \ldots\ldots\ldots\ldots (2)$$

From Fig. 4,

$$U_c = 0.00842\,V + 10.9 \quad \ldots (3)$$

From Fig. 5,

$$U_c = 0.1375\,L + 11.4 \quad \ldots (4)$$

---

[1] Dynamic Characteristics of a Solid Chemical Desiccant, by W. L. Ross (Doctoral Thesis, Department of Mechanical Engineering, The Pennsylvania State University, June 1954).

Journal Section

Proceeding now with the design equation derivation,

$$\begin{aligned} U_c &= f\,(T, R, C, B) \\ dU_c &= (\delta U_c/\delta T)\, dT \\ &\quad + (\delta U_c/\delta R)\, dR \\ &\quad + (\delta U_c/\delta C)\, dC \\ &\quad + (\delta U_c/\delta B)\, dB \ldots \quad (5) \end{aligned}$$

From Equation 1,

$$\begin{aligned} \delta U_c/\delta T &= -0.714 + 0.0152\,T \\ &\quad -0.00008232 T^2 \ldots (6) \end{aligned}$$

From Equation 2,

$$\delta U_c/\delta R = 0.505 \ldots\ldots\ldots \quad (7)$$

Since the face area of the bed was 2 sq ft, then $C = 2V$ and Equation 3 can be written as

$$U_c = 0.00421\,C + 10.9 \ldots \quad (8)$$

and from Equation 8,

$$\delta U_c/\delta C = 0.00421 \ldots\ldots\ldots \quad (9)$$

Since the bed diameter was 19.18 in., then $L = 19.18\,B$, and Equation 4 can be written as

$$U_c = 2.6373\,B + 11.4 \ldots \quad (10)$$

and from Equation 10,

$$\delta U_c/\delta B = 2.6373 \ldots\ldots\ldots \quad (11)$$

Substituting Equations 6, 7, 9, and 11 into Equation 5 yields

$$\begin{aligned} dU_c &= (-0.714 + 0.0152\,T \\ &\quad -0.00008232\,T^2)\, dT \\ &\quad + 0.505\, dR + 0.00421\, dC \\ &\quad + 2.6373\, dB \ldots\ldots \quad (12) \end{aligned}$$

Assuming that the functions involved are continuous and that each has an indefinite integral,

$$\begin{aligned} U_c &= -0.714\,T + 0.0076\,T^2 \\ &\quad -0.00002744\,T^3 + K_1 \\ &\quad + 0.505\,R + K_2 \\ &\quad + 0.00421\,C + K_3 \\ &\quad + 2.6373\,B + K_4 \\ &\quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (13) \end{aligned}$$

Combining the four constants of integration in Equation 13 and taking their sum to be approximated by a pure constant,

$$\begin{aligned} U_c &= K - 0.714\,T \\ &\quad + 0.0076 T^2 \\ &\quad - 0.00002744\,T^3 \\ &\quad + 0.505\,R + 0.00421\,C \\ &\quad + 2.6373\,B \ldots\ldots \quad (14) \end{aligned}$$

Next, apply this equation to all of the adsorption tests conducted to determine the value of K. For example, in our Test No. 1 the following conditions prevailed:

$$\begin{aligned} U_c &= 11.77 \text{ percent} \\ T &= 79.0 \text{ F} \\ R &= 25.8 \text{ percent} \\ C &= 110.6 \text{ cfm} \\ B &= 0.20855 \end{aligned}$$

Substituting these values into Equation 14 yields

$$K = 20.23$$

Results of the substitution from all of the tests are given in Table 2.

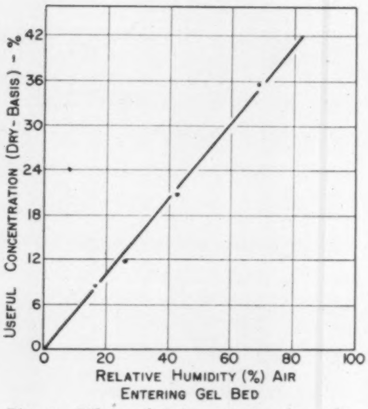

Fig 3—Effect of inlet relative humidity on useful concentration

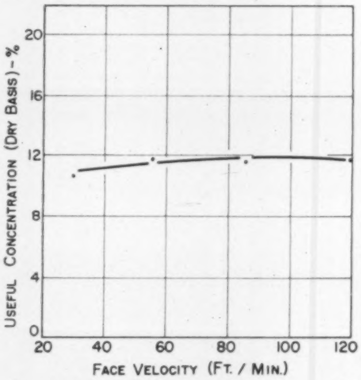

Fig. 4—Effect of face velocity on useful concentration

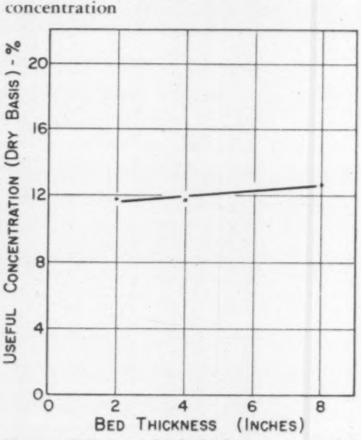

Fig. 5—Effect of bed thickness on useful concentration

The average of the required K's is 20.12, so the final prediction equation becomes

$$\begin{aligned} U_c &= 20.12 - 0.714\,T \\ &\quad + 0.0076\,T^2 \\ &\quad - 0.00002744\,T^3 \\ &\quad + 0.505\,R + 0.00421\,C \\ &\quad + 2.6373\,B \ldots\ldots \quad (15) \end{aligned}$$

Using this same technique with the appropriate curves from the test data, the following eight additional design equations were evolved:

Breakpoint Useful Concentration

$$\begin{aligned} U_B &= -\,4.60 + 0.3323\,T \\ &\quad - 0.00321\,T^2 \\ &\quad + 0.00000895\,T^3 \\ &\quad - 0.0391\,R + 0.00875\,C \\ &\quad - 0.000281\,C^2 \\ &\quad + 0.000001056\,C^3 \\ &\quad - 2.3975\,B \ldots\ldots \quad (16) \end{aligned}$$

Completion Time per Pound of Adsorbent

$$\begin{aligned} t_C/G &= 83.7 - 2.914\,T \\ &\quad + 0.03143\,T^2 \\ &\quad - 0.0001148\,T^3 \\ &\quad + 0.2799\,R \\ &\quad + 127.63(\mathrm{C})^{-0.625} \ldots (17) \end{aligned}$$

Breakpoint Time per Pound of Adsorbent

$$\begin{aligned} t_B/G &= 4.83 - 0.01836\,T \\ &\quad + 2.781\,(0.707)^{R/10} \\ &\quad - 0.0588\,C \\ &\quad + 0.0002968\,C^2 \\ &\quad - 0.0000004952\,C^3 \ (18) \end{aligned}$$

Adsorption Efficiency (to Breakpoint)

$$\begin{aligned} E_B &= 168.3 - 3.625\,T \\ &\quad + 0.0555\,T^2 \\ &\quad -0.0002923 T^3 - 0.279 R \\ &\quad + 24.4\,(0.716)^{C/20} \\ &\quad + 159.96\,B \\ &\quad - 577.191\,B^2 \\ &\quad + 487.696\,B^3 \ldots\ldots \quad (19) \end{aligned}$$

Completion Useful Concentration Desorbed

$$\begin{aligned} U_D &= 8.08 - 0.275\,T \\ &\quad + 0.0017 T^2 - 0.0000029 T^3 \\ &\quad + 0.494\,R + 40.182\,B \\ &\quad - 127.836\,B^2 \\ &\quad + 132.296\,\mathrm{B}^3 \ldots\ldots \quad (20) \end{aligned}$$

Complete Desorption Time per Pound of Adsorbent

$$\begin{aligned} t_D/G &= 10.34 - 0.01478\,T \\ &\quad + 0.2031 R - 0.004884 R^2 \\ &\quad + 0.00004157\,R^3 \\ &\quad + 1.274\,(B)^{-0.4648} \\ &\quad - 8.98\,(W/1000) \\ &\quad + 2.326\,(W/1000)^2 \\ &\quad -0.205\,(W/1000)^3 \ (21) \end{aligned}$$

Temperature-Rise Time per Pound of Adsorbent

$$
\begin{aligned}
t_R/G = {} & 6.546 - 0.00573\,T \\
& + 0.02383\,R \\
& - 0.0001683\,R^2 \\
& - 25.312\,C_W \\
& - 3.6162\,(W/1000) \\
& + 0.83244\,(W/1000)^2 \\
& - 0.064767\,(W/1000)^3 \\
& \ldots\ldots\ldots\ldots\ldots\ldots \quad (22)
\end{aligned}
$$

Economy of Desorption to Temperature Rise

$$
\begin{aligned}
M_R = {} & 5.15 - 0.0628\,T \\
& + 0.0006063\,T^2 \\
& - 0.000001875\,T^3 \\
& - 0.0231\,R \\
& + 0.0001778\,R^2 \\
& - 19.46\,C_W - 7.8964\,B \\
& + 21.6125\,B^2 \\
& - 19.1071\,B^3 \\
& - 0.14332\,(W/1000) \\
& - 0.025\,(W/1000)^2 \\
& + 0.008333\,(W/1000)^3 \\
& \ldots\ldots\ldots\ldots\ldots\ldots \quad (23)
\end{aligned}
$$

Solution of Sample Problems

Several sample problems will now be solved through the use of the foregoing prediction equations.

Example 1: For a certain dehumidification job the air to be dried will enter the desiccant (6-16 mesh silica gel) at the design conditions of 80 F dry bulb and 45 percent RH (relative humidity). The dehumidifier has a cylindrical bed 18 in. in diameter and 6 in. deep.

Estimate the maximum rate of air flow that can be used if adsorption efficiency (to breakpoint) must be maintained at 85 percent or higher.

Solution: Refer to Equation 19. Substituting $T = 80$, $R = 45$, $B = 6/18 = 0.333$ and $E_B = 85$ into Equation 19 yields

$$
\begin{aligned}
85 = {} & 168.3 - (3.625)\,(80) \\
& + (0.0555)\,(80)^2 \\
& - (0.0002923)\,(80)^3 \\
& - (0.279)\,(45) \\
& + (24.4)\,(0.716)^{C/20} \\
& + (159.96)\,(0.333) \\
& - (577.191)\,(0.333)^2 \\
& + (487.696)\,(0.333)^3
\end{aligned}
$$

simplifying

$$24.4(0.716)^{C/20} = 6.46$$

or

$$(0.716)^{C/20} = 0.265$$

from which

$$C/20 = 4$$

therefore,

$$C = 80 \text{ cfm}$$

Table 2—Determination of Empirical Constant, K

Test No.	Experimental U_c		Required K
1	11.77	$= K - 8.48$	20.23
3	11.59	$= K - 7.55$	19.14
5	11.77	$= K - 6.90$	18.67
7	10.70	$= K - 8.94$	19.64
9	8.55	$= K - 13.21$	21.76
11	20.50	$= K + 0.01$	20.49
13	35.47	$= K + 13.28$	22.19
15	14.62	$= K - 4.48$	19.10
17	11.40	$= K - 8.14$	19.54
21	11.84	$= K - 8.52$	20.36
23	12.66	$= K - 7.59$	20.25

Example 2: It is desired to set an automatic valve-shifting timer on a dehumidification machine so that the cycle is switched to regeneration at a point about halfway between breakpoint and completion times. Inlet air is at 80 F dry bulb and 30 percent RH. Silica gel (6-16 mesh, 42 lb/cu ft dry density) is the adsorbent, and the bed dimensions are 16 in. diameter, 5 in. depth. Rate of air flow is 70 cfm.

Estimate the time after the beginning of adsorption for which the timer should be set.

Solution: Refer to Equation 17. Substitution of T = 80, $R = 30$ and $C = 70$ into Equation 17 yields

$$
\begin{aligned}
t_c/G = {} & 83.7 - (2.914)\,(80) \\
& + (0.03143)\,(80)^2 \\
& - (0.0001148)\,(80)^3 \\
& + (0.2799)\,(30) \\
& + (127.63)\,(70)^{-0.625} \\
t_c/G = {} & 10.32 \text{ min/lb gel}
\end{aligned}
$$

$$
\begin{aligned}
\text{Bed volume} & = (\text{Face area})\,(\text{Depth}) \\
& = (\pi)\,(8/12)^2\,(5/12) \\
& = 0.5818 \text{ cu ft}
\end{aligned}
$$

$$
\begin{aligned}
\text{Dry weight of gel} & = (\text{Bed volume}) \times (\text{Dry density}) \\
& = (0.5818)\,(42) \\
& = 24.44 \text{ lb}
\end{aligned}
$$

Therefore, *completion time*, $t_c = (10.32)\,(24.44) = 252$ min

Next, refer to Equation 18. Substituting $T = 80$, $R = 30$ and $C = 70$ into Equation 18 yields

$$
\begin{aligned}
t_B/G = {} & 4.83 - (0.01836)\,(80) \\
& + (2.781)\,(0.707)^3 \\
& - (0.0588)\,(70) \\
& + (0.0002968)\,(70)^2 \\
& - (0.0000004952)\,(70)^3 \\
t_B/G = {} & 1.51 \text{ min/lb gel}
\end{aligned}
$$

Therefore, *breakpoint time*, $t_B = (1.51)\,(24.44) = 37$ min.

Thus the timer should be set for 37 + (½) (252 − 37) = 144 min.

Virtues and Faults of Method

If the experimental results are reasonably accurate and if the functions of the design or prediction characteristics are not unduly physically erratic, the foregoing analysis method has the following virtues: (*a*) No simplifying assumptions about the physical system as such are made. For example, no particular mechanism of localized adsorption was assumed; the adsorbent particles were not assumed to be smooth spheres; no perfect fluid qualities were ascribed to the adsorbate; (*b*) It is adaptable to any dynamic system providing the prescribed test methods are used; (*c*) Based on relatively few experimental tests, it predicts an estimate of those factors which the engineer wants most concerning dynamic adsorbent behavior under a great number of combinations of inlet conditions; (*d*) Having once formulated the equations for a given system over the desired range and tabulated the results, the method can be readily used by anyone whether or not he is mathematically or technically trained.

The disadvantages inherent to the method are: (*a*) predicted characteristics at best can be only as accurate as the test data; (*b*) reliability of predictions decreases toward the range limits of the variables, *i.e.*, as the variables move away from their respective standard values; (*c*) inter-variability of primary variables is not fully accounted for; (*d*) each different system requires an experimental investigation and analysis; and (*e*) certain factors such as adsorbent grain size and bed geometry, which have some effect on adsorbent characteristics, are not considered, although with the added complication of extra tests and extra terms in the equations they could be included.

Control of the Industrial Environment

By P. J. Marschall*, North Chicago, Ill.

The purpose of the Technical Advisory Committee on the Industrial Environment is to perform the following function: *Development of practical information on: (a) the control of industrial atmospheres to meet the requirements of health, comfort, safety, and production; and (b) the abatement of atmospheric nuisances and the recovery of air-borne wastes.*

This is an extremely broad scope and to facilitate the work of the committee, six sub-committees were given the following assignments: Supply Air (industrial), Process Aerodynamics. Air Contaminants (indoor and outdoor), Temperature Extremes (hot environment), Exhaust Air Cleaning (air pollution control), and Industrial Exhaust Systems.

Supply Air (Industrial)

In general, any industrial air-conditioning problem in processing may be classified under control of one or more of the following: (1) hygroscopic moisture content, (2) rate of chemical reactions, (3) rate of biochemical reactions, (4) rate of crystallization, and (5) temperature for close tolerance, machining and grinding.

The scope of this committee also includes recommendations for design of air supply systems for general ventilation, make-up air, and systems for exhausting fumes, gases, and vapors.

Process Aerodynamics

In this area we currently have a Society sponsored project under way at the University of Pittsburgh. Under the direction of Prof. T. F. Hatch, experimental data are being collected on the *Design of Local Exhaust Ventilation for Hot Industrial Processes.* In the study of this problem, Professor Hatch is using hot bodies of various sizes operating at different temperatures to establish the relationship between the quantity of air set in motion, distance from the hood, quantity of heat released (distinguishing between the radiant and convective heat), and the geometry of the body.

Air Contaminants

This subcommittee is responsible for supplying information on toxic characteristics of gaseous matter in the atmosphere. Most of the information published in The Guide on maximum allowable concentration of gases and vapors is obtained from the *American Conference of Governmental Industrial Hygienists.*

In many instances the maximum allowable concentration is not a fixed limit but is subject to revision with the development of new information based on more complete environmental and medical studies.

Industrial Exhaust Systems

This subcommittee is concerned with recommendations for hood design, capture velocities, and transport velocities to collect and remove fumes, mists, vapors, and gases, and heavy loadings of materials.

Exhaust Air Cleaning

The various principles involved in the operation of industrial air and gas cleaners are illustrated by the following types: (1) inertial separators, (2) wet collectors and scrubbers, (3) filters, (4) electrostatic precipitators, and (5) adsorbers, absorbers, and combustion devices.

The subcommittee prepared three new tables for The Guide, 1954, giving the important characteristics of the inertial separators, wet collectors, and fabric filters.

Comments on the usefulness of this type of table which, obviously, cannot be too specific will be of interest to our committee.

Temperature Extremes

In the hot environment the problem is that of providing tolerable working conditions rather than comfort conditions. Very little information is available on the effects of air motion, humidity and radiation at different work rates and with different ages and sexes of people at extreme temperatures. We need to develop a method for measuring the stress in human beings and possibly a method of measuring human work efficiency.

Stress factors such as temperature, humidity, skin temperature, rectal temperature, and pulse rate will necessarily have to be established through research conducted by qualified doctors and physiologists.

General

It is generally recognized that factory productivity will increase if the detrimental aspects of a work situation are removed. Extremes in heat, cold, humidity, fumes, dusts and radiation, can reduce man's efficiency because some of his body energy is lost in adjusting to the extremes of the environment. In recent years, much has been done to provide a better industrial environment as management is becoming increasingly aware of the loss of efficiency due to these environmental factors.

Sizeable funds will be required for the research necessary to determine the basic design conditions for a better industrial environment.

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*Chairman, ASHAE Technical Advisory Committee on Industrial Environment.

Panel Cooling for a Residence[†]

By R. R. Irwin*, Stillwater, Okla.

SUMMARY — Data obtained and presented in part in this paper seem to indicate that panel cooling can be used successfully to provide summer comfort in the residence tested. The study was carried out in a college apartment unit under actual living conditions. One of the unexpected results was the importance of the radiant cooling effect of the wall and ceiling panels which gave the occupants a comfortable feeling when discomfort might have been expected because of high humidity readings. The system was designed and operated as a year-round unit, but this paper deals only with the cooling phase.

THE COOLING phase of the process of air conditioning always has been one of the major problems in widespread residential application. The equipment required to carry out the cooling is both complicated and expensive, and requires high-grade and expensive energy for operation. These factors have been largely responsible for the many attempts to provide cooling for human comfort without using refrigeration equipment.

A basic factor to be considered is that all refrigeration processes result in heat being transported from the space or material being cooled to some medium existing at a higher temperature level. The usual medium to which this heat is transferred is the earth or its surrounding atmosphere. This heat transfer is usually accomplished by the well known air-cooled, water-cooled and evaporative condensers. It is evident that the air-cooled and evaporative condensers discharge their heat directly to the medium, atmospheric air. Since most water-cooled condensers now use, or are of necessity being converted to, cooling towers as a source of cooling water, we might say that almost all refrigeration systems discharge their heat to this medium, atmospheric air. The size of equipment and amount of energy required to carry out this cooling process is a function of temperature of this medium, the atmospheric air.

Two different temperature levels are available in the atmospheric air. They are the dry-bulb and wet-bulb temperatures. The dry-bulb temperature is the air temperature as recorded on the standard thermometer and the maximum usually encountered in central Oklahoma ranges from 95 to 105 F. The wet-bulb temperature, which represents the depression of the temperature by evaporative cooling, ranges downward from around 78 deg in extremely hot weather in that same locality.

Many attempts have been made to furnish the cooling effect required in summer to provide comfort for the human body. It is obvious that atmospheric air at temperatures above the normal body temperature is not going to provide effective cooling. The lower wet-bulb temperature of the atmosphere has challenged many men to develop a simpler process than the refrigeration system that has long been used for that purpose.

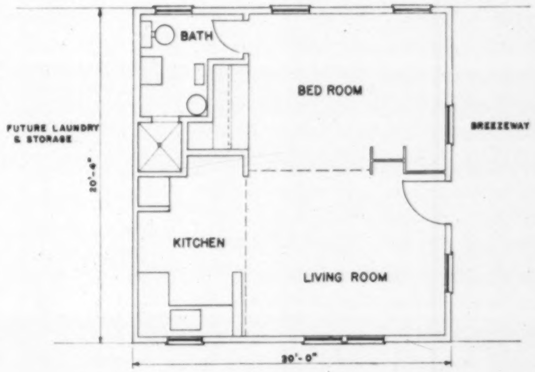

Fig. 1—Floor plan of the apartment

The familiar evaporative cooler is an example of an attempt to apply the wet-bulb medium directly for cooling. These units have a major fault in that the nature of the process results in the addition of moisture to the space being cooled, while the most desirable process is one that removes moisture. Evaporative systems were being used for many applications a few years ago, but, due to the limited comfort results obtained, they are being superseded in many areas.

Panel Cooling Research

Realizing the limitations of the usual evaporative cooling equipment, but reasoning that the wet-bulb temperature level was low enough to produce human comfort, the author initiated a research project in this field in 1949.

In this research, it was proposed to obtain cooling of a medium by circulating water, cooled by evaporation in a cooling tower, through a panel cooling system similar to the conventional hot water panel heating system. The panel cooling system was visualized as coils of pipe built into both the ceiling and walls of the test unit. By including the coils in both walls and ceiling a means would be provided to intercept the heat flowing into the space from the outside.

Preliminary Hot Box Tests

In the first stage of the investigation, a typical section of a frame building wall equipped with a pipe coil was tested in a *guarded hot box*. By testing the section in the *guarded hot box* any desired summer temperature could be simulated inside the box. Since the temperature of water from a cooling tower is a function of the outside air wet-bulb temperature, the tests were run with variable water temperatures in order to predict the overall performance of the cooling panel. These tests furnished values for inside wall surface temperatures to be obtained with various cooling water temperatures when the wall was subjected to a heat source similar to that caused by outside summer heat.

[†]This paper is the result of research by the School of Mechanical Engineering and the Division of Engineering Research, Oklahoma Agricultural and Mechanical College.

*Associate Professor, Mechanical Engineering, Oklahoma Agricultural and Mechanical College.

Presented at the Oklahoma Regional Meeting of the AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS, INC., Oklahoma City, April 1955.

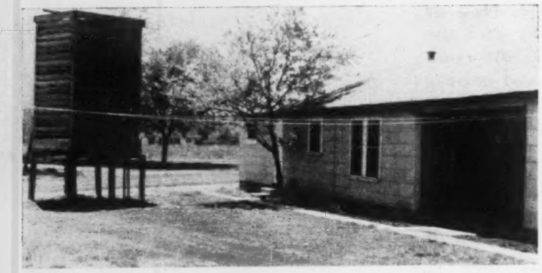
Fig. 2—Outside view of apartment showing also the cooling tower

This preliminary work provided some useful guides for further investigation. The results indicated that the temperature of the water flowing through the panel coil was at all times lower than both the inside and outside wall surface temperatures, indicating that heat was flowing from both surfaces to the coil inside the wall. The logical conclusion would be that a cooling panel of this type could stop successfully the flow of summer heat from outside to the interior of a building. It would also be logical to conclude that this same panel will have a cooling effect on the interior of a building.

The Test Apartment

The investigation with the *guarded hot box* left the impression that a building might have a heat gain from various sources in excess of the cooling ability of the system. However, the results were so encouraging that it was decided to expand the research, and conduct tests under actual living conditions in an apartment in the college housing facilities. The unit selected (see Figs. 1 and 2) was a one-story frame structure about 20 ft square, isolated on one side by a covered breezeway about 10 ft wide and on another side by a storage room, with two weather-exposed walls. The floor consisted of a concrete slab on the ground. The stud spaces in the walls were filled with loose rock wool, and the ceiling was covered with the same material. The panel coils, consisting of $3/4$ in. copper tubing on centers of 6 in., were mounted on the inside of the existing wall board. The coils were then covered with plaster to form new walls and ceiling for the interior. The installation of a water circulating pump and cooling tower completed the cooling system.

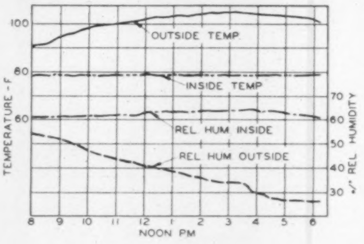

Fig. 3—Inside and outside air temperatures and relative humidities as recorded on a typical hot summer day

Since the purpose of the research was to determine the effect of the system on human comfort, it was decided that the apartment should be rented to tenants by the college with the understanding that the tenants would cooperate with the testing. Recording instruments were used to obtain data on the temperature and relative humidity, both inside and outside, and water temperatures on entering and leaving the panel coils. In addition, the occupants were interviewed at various times, and a number of people who visited the apartment were interviewed concerning their feeling of comfort.

Test Results

From the data recorded over a period of two years testing, Figs. 3, 4, 5, 6, and 7 have been prepared showing data of representative typical days from the standpoint of summer weather conditions. Figs. 3 and 4 represent typical hot summer days with some variation of humidity. Fig. 5 represents the hot dry summer day, while Fig. 6 represents the cool dry day and Fig. 7 represents the cool humid summer day.

A feature noted as the test charts were studied was the small variation in the values of inside temperatures and humidities. Many of the test charts (not shown here) indicate inside temperature variations not to exceed 1 deg, while the outside temperature varied by as much as 20 deg.

The technical data obtained from the apartment test unit agree with the data of the preliminary *guarded hot box* investigation to a very great extent. However, the resulting inside atmospheric conditions from the apartment test and their effect on comfort were rather startling. The tests indicated that the inside temperature at no time during the whole period exceeded $82\frac{1}{2}$ F with outside temperatures reaching as high as 106 F. Since no attempt was made to control the inside temperature of the apartment, the room temperatures varied from the maximum to the low

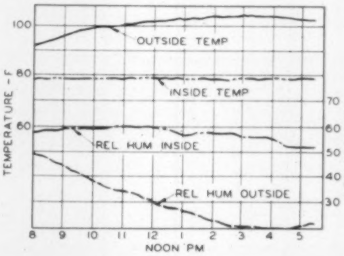

Fig. 4—Inside and outside air temperatures and relative humidities as recorded on a typical hot hummer day

seventies, depending on the outside wet-bulb temperature. As was to be expected, the relative humidity in the room varied somewhat with the outside relative humidity, but not uniformly. The test instruments recorded a condition of around 70 percent RH (relative humidity) on muggy days. The occupants indicated that, while they felt cool, the air had a close, stagnant feeling. The use of an ordinary room fan provided enough air circulation to remedy this situation. The occupants' comfort reaction after two summers of testing ranged from *very comfortable* to *fairly comfortable*, but at no time was a feeling of discomfort reported. The reactions of the various visitors interviewed agreed in the main with the occupants' feelings.

Why No Discomfort?

Plotting values of inside temperatures and humidity on the *comfort chart* readily explains the comfort reactions of the people from *very comfortable* to *fairly comfortable*, but it does not explain the failure to register discomfort, as some of the values do not fall within the comfort zone. The explanation of the degree of comfort seems to lie in the effect of radiation on the heat loss of the human body. A widely used equation[1] gives some indication of the relation between air and surface temperatures and a feeling of comfort. The equation is

$$t_s + t_a = 160 \quad \text{...............} \quad (1)$$

where

t_s = mean surface temperature, Fahrenheit degrees.

t_a = room air temperature, Fahrenheit degrees.

160 = a constant* based on air and surface temperatures of 80 F.

A study of a typical residence cooled by circulating cool air will show that the temperatures of the inside surfaces of ceilings, exposed walls, windows and doors are higher than the room air temperature. Normally, the surfaces of the floors and partition walls are cooler than or equal to the room air temperature. If the mean value of these surface temperatures is greater than 80 F, then the room air must be maintained at a temperature below 80 F to give the desired feeling of comfort.

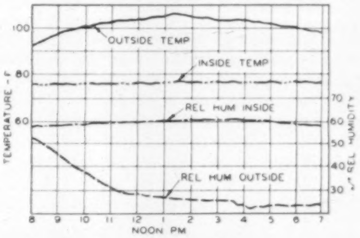

Fig. 5—Inside and outside air temperatures and relative humidities as recorded on a hot dry summer day

It would seem to follow then, that the factors of temperature and humidity of air and the temperatures of surrounding surfaces must be evaluated in determining the degree of comfort of a room. When this investigation was started, it was felt that the lack of dehumidifying equipment in the system would result in conditions of discomfort during muggy weather. The test data show that conditions of high humidity did occur, but the reactions of the occupants were not ones of discomfort, as expected from the comfort chart. In fact, the occupants at times expressed a preference for the conditions maintained in the apartment to those maintained in the usual air conditioned spaces. There can be no doubt that the radiant cooling effect of wall and ceiling panels offsets the warming effect of the high humidity.

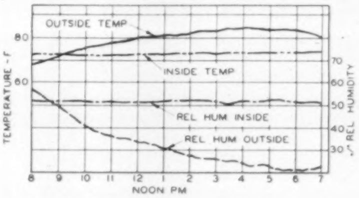

Fig. 6—Inside and outside air temperatures and relative humidities on a cool dry day in summer

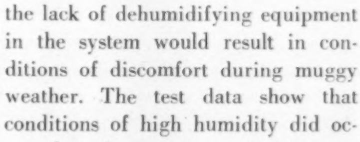

Fig. 7—Inside and outside air temperatures and relative humidities on a cool humid day in summer

This theory would seem to be borne out by other research[2] carried out at the University of Florida. A study of the use of water spray to cool roofs of buildings indicated that the feeling of comfort was improved by cooler ceiling temperatures with no accompanying reduction in the air temperature of the space.

Conclusion

No attempt has been made in this report to present in detail the great mass of data collected or to describe the testing procedure in detail. It is recognized that all phases of the research have not been completed. Unfortunately, the testing facilities did not permit a full evaluation of the radiation effect on the occupants' comfort.

The use of cooling panels in rooms having a high internal heat gain and comparatively small weather walls and ceilings would present a different problem from that encountered in the type of residence tested.

Air motion is an important factor in comfort control, and it seems unlikely that a panel cooling system without any means of circulating air would be as comfortable as desired. It is likely that some applications would have latent gains that would require dehumidifying equipment in addition to the panel cooling system.

However, the conclusion, based on the test data and the comfort reactions of the occupants, indicates that it is possible to provide summer comfort in a residential unit with a panel cooling system using a cooling tower as the only source of cooling effect, at least in the summers experienced in Oklahoma.

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[1] Radiant Energy Exchange as a Factor in Airplane Cabin Heating, by B. F. Raber and F. W. Hutchinson (*Journal of the Aeronautical Sciences*, July 1944).

*For heating, this constant is usually stated as 140, but 160 is believed more nearly to indicate the relationship to the higher air and surface temperatures involved in cooling.

[2] Roof Spray for Reduction in Transmitted Solar Radiation, by G. E. Sutton (ASHVE TRANSACTIONS, Vol. 57, 1951, p. 321).

Technical Discussions at 61st Annual Meeting

Papers presented at the Second, Third and Fourth Technical Sessions produced many comments and suggestions — reported here in abstract form.

Preliminary Studies of Heat Removal by a Cooled Ceiling Panel, by L. F. Schutrum, John Vouris and T. C. Min (published in ASHAE Journal Section, *Heating, Piping & Air Conditioning,* February 1955, pp. 241-245).

E. F. Snyder, Jr., Minneapolis, Minn., (Written), noted that this paper is the first contribution in a Laboratory research program and that it does not take into account the introduction of conditioned air, the effects of luminaires, or the effects of solar radiation. He felt that the paper does show the soundness of the inversion theory, but questioned whether the theory holds for all conditions. He felt also that the dew point of the air in the space is important as a lower temperature produces condensation. He pointed out that under some conditions only a small rise in relative humidity might mean that the cooled surface panel would be below the dew point temperature.

H. B. Nottage, Encino, Calif., (Written), asked that the authors present a complete fundamental treatment of the use and limitations of AUST.

J. R. Carroll, Urbana, Ill., (Written), felt that radiant energy exchange may be much more important in panel cooling design than in panel heating. The non-steady state of the heat transfer involved in cooling also serves to complicate the energy exchanges. The present paper deals only with steady state heat transfer, but in Professor Carroll's work he has dealt with surfaces below the room air temperature and with dehumidified air being introduced into the room. He pointed out that such systems have an inherent self-balancing characteristic in that heat not picked up by the cool panel surface is picked up by the air. Tests made with a floor panel installation have shown that 70-80 percent of the cooling load is absorbed by the panel and 20-30 per cent by the introduced air. He believed that the value of 21.6 Btu per hour shown in the author's Fig. 3 is close to what might be expected in residential installations, but if the room load were higher and the panel temperature maintained steady, the room air temperature would rise above 80 F and in such a case the roof heat gain would serve to reduce the room load on the panel. He felt that limiting panel temperatures before condensation and methods of control over this temperature are essential to the design and use of closed panel cooling systems. He believed that much interest could be created in using separate dehumidifiers to control humidity in ceiling panel cooling systems. He felt that studies in the room cooled by the panel and with conditioned air would be valuable.

C. S. Leopold, Philadelphia, Pa., (Written), stated that he believed that the paper was in error in concluding that ceiling panel cooling is an inversion of floor panel heating. He believed that the source of the difficulty is that cooling installations are designed on the basis of occupancy for daytime use, with artificial light and sunlight, while heating systems do not take all these factors into account. In tests he had found that from 1.5 to 37 percent of the source energy can be removed in a panel cooling system without depressing the panel temperature, and this percentage depends on the type of luminaire and the type of ceiling paint used. Similar reasoning and tests can be applied to the solar load. He believed, therefore, that the panel area and its temperature for cooling would depend on taking all these factors into account. In view of this, he felt that the conclusion of the paper should have stated that ceiling panel cooling for the transmission load is an inversion of floor panel heating. He noted that the Laboratory paper does state that further work is to be done on luminaires, sun-heat and use of conditioned air.

A. J. Hess, Los Angeles, Calif., (Written), called attention to this paper representing the start of Society research work with radiant cooling. He expressed regret that lack of funds did not permit this to go ahead more rapidly. He hoped that with this preliminary work completed, the cooling research project could quickly move on to study the effects of luminaires and solar heat gains.

P. B. Gordon, New York, N. Y., remarked that an interesting point in this work is the split-up of the radiant exchange and the convection exchange. He noted that in the data given in the paper, the convection coefficient appeared to change considerably at various points, whereas the radiant coefficient remained substantially steady. He felt that this point should be explained. He also pointed out that the intent of the Laboratory program is to maintain heat exchange under controlled conditions and not under field or operating conditions and that the resulting data should be interpreted with a knowledge of this intent. He felt that the nature of the experiments was one reason why the authors were interested in calling attention to the conclusion concerning the inversion theory although it is recognized that the theory might not hold when the experiments are extended to take in luminaires, solar energy, thermal storage, and use of conditioned air.

A. T. Jorn, North Chicago, Ill., was interested in noting that the figure 21.6 Btu in the authors' paper is essentially the same as that found in other private studies. He felt that since the data in the authors' Fig. 3 is based on the specific condition, the result could be readily misinterpreted. He pointed out that under the conditions stated in the paper, the AUST is fixed by the steady conditions, while in an actual room, the AUST would probably vary. Also, he mentioned that the ceiling height is a factor in determining AUST, and that since the data in Fig. 3 is for a fixed ceiling height, this point should be kept in mind in interpreting the data. He also stated that with ceiling panels having non-uniform temperatures the results differ greatly from those obtained with panels at uniform temperatures.

P. R. Achenbach, Washington, D.C., indicated that in interpreting the data in the author's Table 1, it appeared to him that the amount of infiltration air used made no difference in the heat transfer so long as the infiltration air was at room temperature. He also believed that the data in the paper should be helpful in making residential use of panel cooling. It seemed to him that some two-stage arrangement might be worked out for such installations using single stage with low temperature differences and a second stage with dehumidification as the outdoor temperature rose. It also seemed to him from the data in the paper that a ceiling panel making use of metal plates with tubes clipped to them would be advantageous, since they would present a small difference in temperature between the water temperature and the temperature of the panel surface.

Lester T. Avery, Cleveland, Ohio, thought that the relationship between the Laboratory tests and the practical application of the data should be pointed out. He felt that with present knowledge it seems apparent that in cooling a ceiling panel with horizontal air flow across it, one can reduce ceiling temperature and also go part way in cooling the room. He also believed that the radiant effects from any panel have an important bearing on the feeling of comfort. He pointed out that the high intensities of fluorescent lighting can be considered as panel heaters. He felt that it should be emphasized that the ceiling acts the same way regardless of the source of its heat energy.

Authors' Closure (L. F. Schutrum): The author thanked Mr. Avery for his suggestions concerning the comfort angle in future studies. He felt that probably the inversion would not hold when additional factors are introduced into the studies. He remarked that it is proposed to include data on the convection coefficients in a future paper. The choice of 69 deg for the data of Fig. 3 was arbitrary. As regards the point made by Mr. Achenbach, he indicated that at temperatures other than 80 F as shown in the paper, the infiltration air did cause a change in the room air temperature and in the panel output. At higher infiltration air temperatures, the heat picked up by the panel increases but at lower temperatures it does not increase appreciably. He also pointed out that the surfaces of the Laboratory test room are deliberately kept at a constant temperature, and that in this respect, the Laboratory does not represent an actual room. The AUST is the area-weighted average temperature for the four walls and the floor. In the few tests made, it was found that a uniform environment and a non-uniform environment perform similarly. The author felt that Mr. Snyder's comments are timely and that the control of relative humidity is of great importance. However, the tests reported in the paper were not intended to solve this problem since the conditions were deliberately maintained at 50 percent RH plus or minus 10 percent. A few tests were run with lower relative humidities. The major problem under study was a prime limitation on this phase of the project. It is expected, however, that in a future phase, the cooled panels and conditioned air will be studied with the latent load handled by conditioned air.

Measurement of Angular Emissivity, by A. Umur, G. V. Parmelee and L. F. Schutrum (published in ASHVE Journal Section, *Heating, Piping & Air Conditioning*, November 1954, pp. 135-140).

H. C. Brown, Lancaster, Pa., (Written), observed that he considered data of this character of great value to the Society particularly in connection with panel heating and cooling. He pointed out that the data confirmed measurements made earlier by various physicists. He asked concerning the application of the angle factor of the thermopile in Equation A-2. He believed that the use of a dimensionless emissivity factor in the authors' paper should be more fully explained and that it might perhaps more accurately be termed an apparent emissivity.

P. H. Weitzel, Harrisburg, Pa., was interested in the texture effect on the angle formula and asked if the surfaces are coplaner. He felt that the emissivity from surfaces held at different angles might be affected by the nature of the surfaces studied. The author stated that the surfaces were anodized aluminum.

Authors' Closure (G. V. Parmelee): The author remarked that no details concerning the structure of the surface are available other than that the surface is highly polished and that the exposed surfaces are plane with the plane of the sample. He felt that use of Equation A-2 was verified by some experiments carried out by the authors at low relative humidities and some at high relative humidities and which brought good agreement with the formula. The angle factor is involved in some of the other parts of the heat balance equation on the radiometer.

Circuit Analysis Applied to Load Estimating, Part II — Influence of Transmitted Solar Radiation, by H. B. Nottage and G. V. Parmelee (published in ASHAE Journal Section, *Heating, Piping & Air Conditioning*, February 1955, pp. 123-131).

S. F. Gilman, Syracuse, N. Y., remarked that the paper is of great interest to all concerned with load estimating. He felt that the procedure looks formidable but that it really is much simpler than it looks especially after a little experience in its use. He also felt that computing machines are convenient but not necessary for work of this character. He had noted a case where a manual computer had been used on the same sort of problem and the time consumed wasn't enormous. He asked the authors' opinion as to how good they thought the experimental assumptions were. Also he thought that some experimental work should be done to determine what happens when the sun strikes the floor. He asked if the authors could outline how the sol-air temperature is distributed in the case of a venetian blind set at 45 deg. He felt that in Fig. 1, the correlation for glass blocks was good and that its influence on the whole would be rather small. In the case of a single glass, however, there would be a time lag and a lower amplitude. He felt that the problem of variation in room temperature is very important and also that the matter of surface coefficients is important and that the values should be pinned down in order to get a good evaluation. He believed that solutions of complicated systems should be handled by analogue, but that the analogue itself should be able to simulate all important values and that in order to feed suitable information into the analogue, it is necessary to know what happens when direct solar radiation strikes a concrete floor, for example. He felt that it was necessary to get some correlation between the heat load as calculated by the thermal circuit technique and the results of actual performance of equipment. Although this latter phase would require field studies, he felt that the work should proceed with this end in view.

Authors' Closure (G. V. Parmelee): The author indicated his appreciation for Mr. Gilman's remarks and stated that he did not know just how good the various assumptions concerning radiation might be. He considered them as rough approximations. He felt that some further experimental observation is needed to complete the data on glass blocks. Also, he stated that the assumption that surfaces completely absorb the incident solar radiation was for convenience. It can be handled by other methods similar to those used in connection with illumination. As regards the problem of the venetian blinds mentioned by Mr. Gilman, he had set up a circuit diagram which was quite similar to the one shown in the present paper. He had used a convection current from the glass to the room air, a convection current from the blind to the room air, a radiation exchange branch between the glass and the blind and this circuit had been found to work out nicely although some estimating of coefficients was required. He agreed with Mr. Gilman concerning the importance of circuit coefficients and said that a breakdown of radiation and convection components of heat exchangers is now being made in the Laboratory. He also agreed that eventually field work should be done to correlate the Laboratory analysis results with the behavior of actual thermal systems.

Gas Is an Important Factor in the Thermal Conductivity of Most Insulating Materials, Part II, by R. M. Lander (published in ASHVE Journal Section, *Heating, Piping & Air Conditioning*, December 1954, pp. 121-126).

R. S. Dill, Washington, D. C., (Written), remarked that substitution of heavier gases for air in the interstices of common insulating material has practical possibilities, but also presents some obstacles. Among the obstacles are the pressure changes encountered and among the advantages are the increased insulation value of the construction. He felt that the idea merits further exploration because of its promise.

C. F. Kayan, New York, N. Y., (Written), asked information on two points. One was what the author meant by *increase in gas transfer* when introducing solid material into a gas filled space. The other question dealt with the matter of the effect of temperature difference on the conductance values of F-12 varying with pressure.

W. A. Danielson, Raleigh, Tenn., (Written), suggested that the author clarify the role of surface conductance of the individual spaces within the insulating material. He felt that conductance in the gas itself should vary with density and that a theoretical explanation would be interesting.

B. M. Palmer,* Newark, Ohio, stated that the author's data agreed closely with that from somewhat similar work which he had conducted. He suggested three points for consideration by the author. One was that in replacing air with a gas, the reduction in k should be expressed as a difference. This difference can be used to approximate the change in a fibrous insulation. This also brings to light that in the coarser fibered materials where convection is greatest at low densities, replacing air with CO_2 or F-12 decreases the convection. As a second point he stated that in his experience it had always worked out that a better k resulted as the fiber diameter is lowered even though the density of the gas is increased. He also wondered if it is justifiable to assume that radiation and fiber conduction are the same if there is no gas present in the interstices or if there is a vacuum with no gas. He felt that if radiation and conduction are both present, errors might be introduced by using the usual tables.

Author's Closure (R. C. Jordan) — In the absence of Mr. Lander, Dr. Jordan stated that the various inquiries would be referred to Mr. Lander at an early date.

Selection of Outside Design Temperature for Heat Load Estimating, by M. L. Ghai and R. Sundaram (published in ASHVE Journal Section, *Heating, Piping & Air Conditioning*, October 1954, pp. 137-143).

C. W. Signor, Detroit, Mich., (Written), had noticed that in heavy-walled buildings in Detroit, a three-day period of low temperatures brought an increase in the heating load each day. Then, during the first day when the outdoor temperature rose to normal, the buildings continued to use large amounts of steam. He believed that this well illustrates the time delay of heat flow.

A. I. Brown, Columbus, Ohio, (Written), found the mathematical analysis interesting and noted that the authors' method applies to transmitted heat only and not to loads due to solar radiation, or other similar loads. He felt that the method would be of little help in most calculations of cooling loads. It would be most useful where heating loads are to be calculated for heavy-walled buildings in localities having short but severe cold spells. When using the authors' method, the calculator would have to use one outside design temperature for the heavy walls and a different temperature for calculating loads due to infiltration or resulting from heat flowing through lightweight sections such as the windows and other surfaces of the same building. He believed that in spite of its many limitations, the method nevertheless is valuable.

F. W. McGhan,† Washington, D. C., (Written), thought that not only thermal lag but changes in moisture also should be considered. He felt that the authors' method would have limited usefulness, and the complication of using many outside design temperatures for a single building. Also, he suggested that some reflective insulations and constructions with air spaces might complicate the proposed method. Present methods do take transmission into account to some extent and he thought that an expansion of such methods might suffice to reduce the disagreement between measured and calculated results.

John Everetts, Jr., Philadelphia, Pa. (Written), on reviewing the authors' paper found that their method caused him to wonder how closely their calculations would approach a measured heat transfer rate. To satisfy himself on this point, he followed their method using an 8 in. brick wall and compared the calculated result with the reports of the measured heat flow as found in the Transactions. The comparison showed the calculated result to be 66 percent higher than the measured flow. He also questioned how important the deviation in end results might be by using the authors' method as against use of the usual procedure. To permit consideration of this on a concrete basis, he calculated the total heat load of a typical suburban department store and found that the transmitted heat is only 0.84 percent of the total, while the load due to people, lights and ventilation accounted for over 90 percent of the load. He concluded that even a wide variation in calculating the transmitted heat load would still affect the total only slightly. He believed, therefore, that the proposed method would have to be extended to take in solar heat and heat storage in order to be of wide usefulness.

S. A. Heider, Washington, D. C., (Written), noted that the authors' method uses maximum and minimum dry-bulb weather temperature data. He felt that use of maximum temperature is too extreme and that while average temperature might be better, it would seem that a temperature based on *incidence of occurrence* should be the real method. He also felt that before too much attention was devoted to obtaining the data covering maximum and minimum dry-bulb temperatures, more attention should be given to preparing data on simultaneous maximum dry-bulb and wet-bulb temperatures.

H. T. Gilkey, Urbana, Ill., (Written), considered that the authors' method was promising for determination of maximum heat flow by conduction, and noted that it might offer a basis for re-evaluation of outdoor design temperatures. He believed though that before the concept can be put into wide practical use, it will be necessary to find some way of using only one design temperature for each locality. He also believed that because of the absence of solar heat and radiation effects, the method might turn out to be of greater use in estimating heat losses rather than heat gains.

E. P. Palmatier, Syracuse, N. Y., thought it important to keep in mind that even in very light structures, the integrating of various components of the load over a long period offers a method of determining heat flows which is simpler than any based on the determination of periodic flow. He also believed that heat lag and storage effects due to the furnishings, contents, and interior walls should be regarded as being a problem as important as that of these same effects in exterior walls.

P. R. Achenbach, Washington, D. C., remarked that a number of concepts are being advanced currently about heat flow computations. One is the use of frequency of recurrence of low and high outside temperatures and another concept would adjust the design temperatures. The authors' paper is related to the latter. He believed that there is sound reason for using different outside design temperatures for structures of different diffusivities. He noted that already there are various values of outside design temperatures in The Guide, and he felt that better guidance should be furnished to the user of the design data, lest the existing confusion become worse. He pointed out that tables could be readily prepared which would permit putting the authors' method into use. He believed that the proposed method possesses enough merit to warrant its consideration by those who are contemplating changes in the existing methods.

Authors' Closure (M. L. Ghai*) — The author agreed that the method does not take radiation into account. The paper was aimed at outlining a method for simplifying just one of the factors entering into the total heat load — not all of them. The authors had considered the idea of incorporating a modification to take radiation into account but realized that if they did so, the method would not be applicable to both cooling and heating load computations. He agreed that the importance of taking periodic flow into account might not be great so far as the total load is concerned, but that so far as the barriers only are concerned, the difference is sometimes great, as the example in the paper showed. He felt that the heat storage of building contents is a wholly separate problem since the contents do not go through the same temperature variations as the barriers do. He repeated that the object of the authors' method is to simplify any existing confusion.

A Theoretical and Experimental Study of Liquid-to-Liquid Heat

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*Owens-Corning Fiberglas Corp.

†Federal Housing Administration.

*Bush Manufacturing Co., West Hartford, Conn.

Transfer in Hot Water Heaters, by F. W. Hutchinson, L. J. LaTart and N. W. Smith (published in ASHAE Journal Section, *Heating, Piping & Air Conditioning*, February 1955, pp. 111-115).

John W. James, Chicago, Ill., remarked on the need in our literature for this kind of information.

M. L. Ghai, Hartford, Conn., asked if the authors had performed any similar experiments on heaters using tubes with very small hydraulic radii — for example, 1/64 in. diameter.

Authors' Closure (F. W. Hutchinson) — The author had not done any work on heaters with the type of tube mentioned but remarked that work of this character is being done by the heat transfer group. The object of the paper was to report how well the overall heat transfer formulas could be used to explain the results of a simple problem and any complicating special conditions had been deliberately avoided.

Solar Radiation During Cloudless Days, by J. L. Threlkeld and R. C. Jordan (published in ASHAE Journal Section, *Heating, Piping & Air Conditioning*, February 1955, pp. 117-122).

C. F. Kayan, New York, N. Y., was interested in the statement in the paper that 40 percent of all energy consumed in the United States is involved in space heating. He wondered if the authors could explain this more fully.

R. W. Haines, Albuquerque, N. M., said that in the Southwest, the climate is ideally suited for applications of solar energy to space heating and that people there are vitally interested. A twelve-story office building in Albuquerque, recently completed, is heated by a heat pump and had large areas of glass on north and south. Recently with outside temperature of 18 at 9:00 a.m. when heating would be expected, actually the whole south side of the building was being cooled.

M. L. Ghai, Hartford, Conn., noticed that the paper indicated that incident solar energy was at a minimum around December 15th. If this is a general condition, he felt it would be helpful, for in space heating, the heaviest demands usually occur in January. He asked if the authors believed that the minimum could be expected to be in December in all localities.

Authors' Closure (J. L. Threlkeld) — The author also regarded New Mexico as a locale with excellent possibilities for solar heating and felt it was interesting to know of an installation with results like those presented by Mr. Haines. He believed that solar incidence on horizontal surfaces would be a minimum about December 15 everywhere. However, the situation is not the same for vertical surfaces and the incident energy is fairly steady on south-facing walls in southerly latitudes but the minimums do occur in northerly latitudes. Dr. Jordan explained how the authors arrived at the estimate of 40 percent of energy requirements mentioned in the paper and commented on by Professor Kayan. The figures generally were from a recent publication concerning the energy of the future. He noted that this source indicated that by 2000 A.D. about 30 percent might more nearly represent the situation, and that it was predicted that the figure would stay at about 30 percent for a long time.

Paths of Horizontally Projected Heated and Chilled Air Jets, by Alfred Koestel (published in ASHAE Journal Section, *Heating, Piping & Air Conditioning*, January, 1955, pp. 221-226).

H. B. Nottage, Encino, Calif., (Written), asked what the author proposed should be done regarding unfilled fundamental needs.

S. F. Gilman, Syracuse, N.Y., (Written), believed that what should be pointed out is that the approximate equation, Equation 2, yields better correlation than the exact equation, Equation 1, and that this should not be expected. He wondered if some important factor might have been unconsidered in developing the equations. He suggested that the results from Equation 1 and Equation 2 would begin to deviate markedly from each other as the slope fixes the angle at values greater than about 13 deg. By the time the angle became as great as 45 deg, Equation 2 would not apply. From this it would appear that the approximate curve fits better than the exact one.

W. O. Huebner, New York, N.Y., directed attention to the immediate usefulness of the equations in the present paper. However, he also wanted to emphasize the value and importance of the work on air distribution which has resulted in a number of Society papers. He felt that bringing the results of all these studies into a single research bulletin would be valuable and hoped that the project would receive serious consideration.

Author's Closure: The author indicated in reply to Dr. Nottage's question, that he considers that this work is problem solving rather than fundamental research. The attempt is to take some results of fundamental research and to rearrange the data to give useful engineering equations. He had no suggestion to offer concerning the course of future fundamental research, but felt that, as an immediate program, more accurate empirical equations could be worked out. He felt that these empirical equations would be more accurate than any analytical equations.

Air Conditioning of Multi-Room Buildings, by R. W. Waterfill (published in ASHVE Journal Section, *Heating, Piping & Air Conditioning*, November 1954, pp. 141-147).

J. S. King, Fairfax, Va., (Written), suggested that Table 2 of the author's paper might well have included estimated installation costs and finance charges for the balance of the air conditioning installation as components of the important overall economy. He would like to hear further comment on the characteristics of the dual-duct system. He felt that the author's final descriptive statement concerning this system should be clarified.

Albert Giannini, New York, N.Y., believed that the single duct primary system, contrary to the author's statement, does not need careful zoning of both air and water. He regarded the single duct primary system as an individual room control system even though it may, for convenience, use multiple sets of apparatus. These can be and usually are operated as a single functional zone. This is possible because of a basic design characteristic of the single duct primary system, whereby flexibility is obtained by scheduling reheat of the primary air as a function of the outside temperature. Each unit's capacity can be matched to the load by throttling the water supply at the unit, thus affording individual room control and avoiding the possibility of over-cooling. He believed that the author's Fig. 6 is misleading because of this. Also, experience with this system has brought no evidence of a humidity problem.

He suggested that in the author's Fig. 8, having to do with a dual-duct one-fan system, allowance was not made for the operating fact that the room thermostat responds to a reduction in sensible load by admitting a greater percentage of undehumidified air from the hot duct, so that the room humidity builds up. He noted that the formulae in the author's paper for calculating relative humidity in rooms served by a dual-duct one-fan system imply a steady state condition, whereas there would be a gradual and continuous rise in humidity where rooms are lightly loaded due to shading or absence of lights for any length of time.

He believed also that the author dismissed too easily operating instability of the dual-duct system which is a volume control arrangement. He cited a recent magazine article whose author pointed out that static unbalance between the hot and cold ducts is a cause for concern. He suggested that such unbalance can be minimized by combining temperature and static pressure control to keep the flow fairly constant in both supply ducts. Other means can be used, but in any case, system stability requires more than simple static pressure regulation.

It seemed to him that there was a conflict between the author's statement that a two-fan system is required to minimize the amount of undehumidified outside air entering the system keeping the hot air duct quantities low with elevated temperatures, and the necessity for keeping these quantitites high and the temperature low in the interest of maintaining system stability.

He found the author's analysis of system performance in an office building not clear as to whether the analysis included both periphery and interior sections or only a periphery section.

He suggested that instead of slight changes in assumed values of primary cubic feet per minute and cold air supply temperatures having but a small effect on the results, such changes might have important effects due to larger ducts, fans and motors being needed.

To him, the air requirements indicated in the author's paper for a double-duct system seemed low at 1.12 cfm per square foot and he introduced a numerical analysis indicating that this figure might be ten per cent greater.

He noted that the author had not stated the basis for arriving at the difference in the operating hours of the refrigeration plant used in the paper. He believed that this basis should be stated in order to do away with questions which otherwise arise in connection with Figs. 10, 11 and 12. In the absence of such a basis, he believed that a difference in refrigerating operating hours might more reasonably be in the order of 10 to 15 percent instead of 33 percent.

For purposes of comparing the operating costs of pumping fluids, he presented some figures for a single-duct primary system and a dual-duct system which led him to the conclusion that in the office building in the author's example, the horsepower requirements for this purpose would be 260 for the single-duct primary system and 492 for the dual-duct system. This appeared to him to be a large penalty to pay for any possible saving in refrigeration operating costs.

He knew of no basis for stating that a dual-duct one-fan system is generally lower in initial cost than a single-duct primary system and believed that a first cost evaluation comparison should include relative space requirements. He believed also that the space occupied by risers and the space occupied by fans would be larger for a dual-duct system than for a single-duct primary system. He was also of the opinion that it would be difficult to substantiate relative cost figures covering operating and maintenance supervision. Figures of this nature as kept by building operators are available for certain single-duct primary system installations and he would be interested in seeing comparable data for large dual-duct systems.

M. G. Kershaw, Philadelphia, Pa., (Written), asked that the author comment on several questions which had occurred to him. *First,* does the author have data which he could present showing a comparison of the required space for each system? *Second,* since the operating costs shown in the author's Table 1 seem higher than those shown elsewhere on modernization of office buildings, he would like to raise this point since the author seemed to indicate that the system which he describes would have a lower operating cost. *Third,* he would like the author's explanation of how cross zone contamination is combatted with recirculation of the supply air. *Fourth,* would the author describe details of the design of outlet which insures against stratification of the two air streams?

S. R. Lewis, Chicago, Ill., (Written), considered the single-duct primary system admirable for exterior rooms, but in cities like Chicago where there are rapid changes in outdoor temperature, considerable time and some skill by the operator are needed to change the water temperature from re-cool to re-heat. Interior spaces usually require separate treatment. It seemed to him that the dual-duct system can be considered a logical sequence of the hot-deck cold-deck heating and ventilating plants long used in school buildings, where each classroom had a thermostat to adjust a double blade damper to admit cool or warm air. Based on experience in modernizing old hotel guest rooms, it seems that the separate air supply ducts can be furred above corridors about as readily as can a single-duct supply. He was not familiar with any acceptable experience using high pressure central air supply intermittently readjusting air volume to obtain individual room temperature control. It seemed to him that room-unit systems with a fan, coil and filter in each unit operating recirculating with a small amount of outside air mixed, probably involved the lowest investment for an old building. The room-unit coil receives chilled water in summer and hot water in winter. He believed that experience amply justified the author's objections to the room-unit method. He added some comments by E. P. Heckel, Chicago, Ill., who is currently participating in proposed revisions of the Chicago Ventilation Code, and who pointed out that the codes in some cities such as Chicago require that more than 0.2 cfm of new air per square foot of floor area be supplied. Also, he believed that recent observations would place the summer design condition at 76 db and 65 to 70 RH, rather than the 80 F and 50 percent RH used in the author's illustrations.

F. W. Chambers, Toronto, Ont., Canada, (Written), called attention to the point that the dual-duct one-fan system as described in the author's paper is covered by a Canadian patent and its use in Canada would require licensing.

R. P. Cook, Rochester, N.Y., (Written), had a feeling that many designers do not design, calculate and compare the economies of several systems before deciding which one to use. He noted that the author had not included any statement about the technical qualifications of the operating superintendent—an important factor. No matter how good the system or the installation, lack of skillful operation could result in high operating costs. Even the best controls need to be understood by the operating personnel or they may fail. Unfortunately, competent operators are not always available and the designer must take this into account, for simplicity of operation is more important than perfect design. Beyond certain rules, economical operation depends on the intelligence and skill of the operator as well as on the complexity of the design.

Author's Closure: The author found the comment by Mr. Cook concerning the operating skill and labor requirements to be both pertinent and well stated. Simplification of operation is always desirable and a decision should be made on the basis of an analysis including it among the factors. He believed, as implied by Mr. Lewis' comments, that the instant availability of warm or cold air, as provided by the dual-duct system, seems basic for best results in multi-room buildings. He noted with interest Mr. Heckel's comment concerning the amount of ventilation air required by certain city codes, but could see no scientific or experience data to justify tendencies toward high ventilation rates. The chief objection to extensive ventilation is that it is so expensive in installation and operating costs. He observed that as a matter of personal experience he had noted that 76 db seems too cool for sleeping and 65 RH seems too humid for working. He regretted that it had not been possible to supply more data on construction and financing as suggested by Mr. King, but was not able to furnish additional data on this. Also, as regards the question raised by Mr. King concerning the matter of heat transfer from an occupied room to an unoccupied room, the air from the unoccupied room simply returns to the recirculating fan and is made available to the warm air duct. As regards Mr. Kershaw's point concerning rentable space occupied by the two systems, he felt it was very small and from what he could determine the difference between them was negligible. The dual-duct system does occupy perhaps one half of one percent more rentable area under average conditions. He believed that the reason why his figures on operating costs seem higher than those previously published is that the present study is based on a ten-hour day and on maximum occupancy during that whole period. With further reference to Mr.

Kershaw's question about combatting cross contamination, he believed that the only way to combat cross contamination would be to live in isolated cells. The principal way to avoid stratification is to make sure that warm and cooled air are mixed prior to the outlet so that the outlet air is uniform in temperature. He regretted that time did not permit answering all the points in Mr. Giannini's discussion, and he had not meant to imply in his paper that the single-duct primary system requires zone control. He had meant that what is usually wanted is to have air and cooled water in certain zones separated. It was undesirable to put a south unit and an east unit or an interior unit on the same primary air and water risers. In Figs. 6 and 7, his intention was not to indicate over-cooling. His analysis was intended to determine the fundamentals and the line to indicate reheat shows what takes place to avoid over-cooling. If no reheat is supplied by either outside air changes or otherwise, then the over-cooling would be a tendency. As regards quantities of air used in dual-duct systems, he would like to have a calculation to find out how a greater value is needed than by taking 25 Btu of sensible heat per square foot of floor area, taking the specific heat of the air, the temperature rise and determining the weight and volume of air required. In either of the systems, the air volume and the water quantities must be estimated, particularly the air volume for the maximum loads in the various rooms. In other words, the unit in each room must be capable of handling the peak loads in that room and which are separate from the combined maximum loads which the refrigerating plant and the heating plant must accommodate.

Effects of Weather Conditions on Cooling Unit Operation in a Residence, by H. T. Gilkey, W. S. Stoecker and S. Konzo (published in ASHVE Journal Section, *Heating, Piping & Air Conditioning*, December 1954, pp. 113-120).

C. H. Neiman, York, Pa., (Written), said that home cooling requirements need special consideration, different from commercial cooling. Applying the same considerations frequently results in over-engineering the residential job with cost too high, equipment too large, no cooling tower space and no means for water disposal. Potentials cannot be realized unless the majority of home owners can afford the expense. He believed that the author had presented facts in his paper tending to confirm the wisdom of using undersized cooling equipment. The data seemed to indicate that the compressor and blower should be operated continuously or nearly so. One way would be to size the equipment in such a manner that it would just carry the load. He called attention to the point that he knew of installations in homes where the occupants report satisfaction with 1½ hp air-cooled units but heat gain calculations show that 2 hp is needed. Some of these installations are houses of 1000 sq ft floor area and inside temperature is kept at 80-85 F with 106 F outside dry bulb. He did not mean to advocate a movement to undersize all home cooling applications, but believed that additional studies should be made to firm up the sizing procedures. He noted also that the paper pointed out the need for better means of estimating annual operating costs. The paper indicated that mean daily temperature is a basis for estimating this, but it does not show how to relate the data to hours of compressor operation. He believed that a method should be developed similar to that used in estimating fuel consumption by degree-days and could be in terms of *degree-days per hour of compressor operation*. The value of this factor would be different for each type of installation. Much additional data would be needed, as mentioned by the authors.

S. A. Heider, Washington, D. C., (Written), called attention to the point that the data in Table 2 showed very well how greatly the severity of summer weather varies from year to year, with 50 days having temperatures above 90 F in 1936 as against only 19 such days in 1935. Temperature averages are of doubtful value with such variations. He believed that the idea of *incidence of occurrence* is to be preferred as it gives the designer some choice and lets him tell his client of the choice he is making. He also felt that instead of a single load index using dry-bulb temperature as mentioned by the authors, an index should combine both dry and wet bulb into a *combined outdoor temperature* and thus give some effect to the important element of moisture load.

K. T. Davis, Cleveland, Ohio, (Written), felt that the paper with its predecessor had contributed significant information as to how an existing warm air heating system can be converted to an all-year plant. He believed that annual variations in summer conditions are so great that most predictions of operating cost should be qualified on the basis of a *cents per degree-day* or *cents per degree-hour* basis, and that such values might be applied to local weather experience with logical explanations of possible deviations. He also asked if the author could add information on a couple of points. Was it to be assumed that the humidity ratios in Fig. 4 were obtained with instruments in the rooms rather than in the return ducts as in Fig. 5? Second, could the authors explain the basis for stating that the pressure losses in the system are approximately double those used in the original design for the duct system for heating?

G. V. Parmelee, Cleveland, Ohio, (Written), was especially interested in the problem of correlating hours of compressor operation with outdoor weather conditions. The difficulty of using a single index is great since the load depends on four factors. He suggested that solar radiation received on a horizontal plane might be suitable for the radiation factor. Either maximum daily dry bulb or mean dry bulb might be used as a second factor, while mean or maximum wet bulb would indicate the magnitude of the heat gain due to infiltrating sensible and latent heat. If arbitrary ranges in the values of each of these factors were set up, hours of compressor operation could be classified for simultaneous values of these weather factors. With enough data it might be possible to plot hours of operation against one variable with the other two held constant. Inclusion of wind velocity might not be needed if day-to-day variations in wind are small. A practical method for evaluating operating costs is urgently needed and the authors' method may serve for interim use. However, the authors' datum of 65 F contrasted with Dr. Gilman's suggestion of 70 F indicates the need for a more thorough analysis before cooling degree-days are calculated. The suggested method requires much data and has the disadvantage that it ignores heat and moisture storage. Nevertheless, such a procedure might shed additional light on the subject and lead to a more suitable basis. Another method would be the use of a thermal circuit, which method offers great advantages.

Authors' Closure (H. T. Gilkey): The author indicated that in the absence of a check he believed the cooling water flow rate varied from 2 to 2½ gpm depending on the load per minute. Water-conserving devices were not used; water was taken from the mains, passed through the unit and discharged to the sewer. He did not have information available on power consumption. He believed that the temperature instruments for the data in Fig. 4 were located in the return duct the same as in Fig. 5. The figures given are averages of dry-bulb and wet-bulb temperature over a 24-hr period. As regards the matter of static pressure, the duct system was designed for handling 560 cfm for heating and 800 cfm for cooling. 560 cfm times the square root of 2 gives 800 cfm, thus indicating that the static pressures were substantially what would be expected from the friction charts. As regards the matter of index of operating cost, he felt that there were many variables involved including weather variables and local considerations. He did not mean to suggest that the figures in the paper should be used as a basis for prediction. In the residence, no fresh air was used although it would need to be in other types of buildings. If the residence were operated occupied then use of fresh air might be necessary. Also, it seemed to him that since no attempt was made to control the indoor wet bulb, and since he believed this is common practice in residences, he was of the opinion that variations in the wet bulb did not contribute greatly to the action of turning the unit on and off.

S. R. Lewis, 50-Year Member, Honored by Illinois Chapter

S. R. Lewis, who was president of the Society in 1914 and recipient of the F. Paul Anderson Medal in 1951, was honored for his 50 years of ASHAE membership at the January meeting of the Illinois Chapter. Pres. G. V. Zintel called upon John W. James, ASHAE first vice president, to make the formal presentation to Mr. Lewis of the scroll prepared by the Society. Vice President James outlined Mr. Lewis' illustrious career, and, in covering early events, described a meeting in 1906 when Mr. Lewis and 13 others petitioned for the formation of the Illinois Chapter. On behalf of the Chapter, President Zintel presented Mr. Lewis with a gold desk set, including an inscribed name plate.

After accepting these honors, Mr. Lewis spoke on *Equipment Room Design*, interweaving historical fact and personal recollection. His talk contained the following highlights of particular interest.

I was ordered to speak at this meeting especially because it is the commencement of a fifty-year membership in the Society. During that period, of course, I have spoken at several chapter meetings on various subjects. I remember one of many years ago that reverberated until it reached the Paris edition of the London Illustrated News................I looked at an old photograph dated 1906 in my office. It shows a dinner meeting of this Society in Chicago. Following this meeting we organized the Illinois Chapter, which was the very first chapter. There are old faces and young faces in that picture. The old faces are those of loved friends who have gone on ahead. An arresting number of the young faces in this picture, however, also are those of men now dead. All of the men at the table at which I sat have gone. The founders of many large organizations that still continue in prominence and effectiveness were present. Engineers, manufacturers, contractors, editors, and educators were represented................ Many direct radiation steam heating systems in 1905 used single pipe connections. Every radiator had a great big combined feed-return pipe and a troublesome hissing-spitting air escape valve. The tendency was to seal the remote ends of the supply mains to wet return mains below the water level in the boiler................

................In 1906 we heard much about a vacuum system of steam heating, in which the ever-helpful Warren Webster of Philadelphia was a pioneer. The end of each steam main and every radiator had a separate outlet for condensate and air. The pipes from these outlets joined a separate return main pipe with a one-way current, as distinct from the original steam pipe which theretofore had been asked to transport both steam and condensate in two-way currents in the same pipe...............

................A Chicago competitor of Webster made a great big float type vacuum trap called a Belvac Thermofier. C. A. Dunham of Chicago, later of Marshalltown, developed a new kind of vacuum trap that employed thermal expansion of a liquid inside a corrugated bellows and this type of trap tended to take the place of the clumsy and costly float device, especially on individual heat transmitters...........The Dunham idea worked well, and worked better yet after especially effective electric vacuum pumps were developed to replace the older reciprocating pumps................

................A Yankee engineer named Jennings, who perhaps, like myself, had milked cows when a boy, found that if one swings a pail nearly full of milk at sufficient velocity, no milk will spill. He caused condensate to be swirled inside an encasement at so rapid a rate that the same sort of force that kept the milk in the pail, could cause spilling of a small part of the condensate and thus could induce air from the return pipes and replacement condensate to enter the pump. This principle of a centrifugal pump for handling air, plus liquid, is widely employed.

................When the Illinois Chapter was founded, the ratings of fans and boilers and radiators were fantastic. ....I remember making a study of cast-iron sectional boiler ratings about 1910 and publishing the results. The variations in ratings of boilers by competitive manufacturers were indeed startling and bore very little consistency to the heat absorbing surfaces, or to the efficiency of the interior water circulation, or even to the grate area. The revolutionary redesign of the American Radiator sectional cast-iron boiler of about that time, in which the rate of coal burning was proportional to the boiler rating, was a potent start toward reliability.........

................It is an illuminating experience even in modern times, to substitute, in a steam boiler, mechanical and positive circulation of the water within the boiler, instead of the sluggish and often erratic thermal circulation.

The ratings of centrifugal fans, as of 1900, similarly bore little relation to the total pressure that they must overcome. The engineer who selected a certain size fan was expected to guess how much to discount the rating of each competitive manufacturer. The housings of such fans had relatively small discharge outlets. In some cases it was the custom to compute the air delivery per inch of fan housing width. If one wanted more air than that promised for delivery by the regular size fan, he divided the rated or assumed air volume delivered, by the inches of housing width and then increased the fan wheel and the housing width as many inches as the figures showed to be desirable. He did this without increasing the size of the fan inlet or the wheel diameter. This resulted in an occasional fan so wide that enough air couldn't enter through the intake to satisfy the outlet................

................Chicago schools were heated by all-indirect fan systems, usually with boilers operated at about 100 pounds steam pressure. The fans and pumps were run by steam engines and the exhaust steam was condensed in the blast coils.

................Nowadays most ventilating systems are designed with means of removing part of the dust and soot that enters with air from out-of-doors.........

................I do not remember much about air filters of 1908, except that coarse pieces of coke were held by wire screens across airways and were sprayed with water. This scheme was not successful. A foreign engineer had some screen pockets of decidedly close mesh that supported hundreds of little metal ferrules like those that hold the eraser on a low priced wooden pencil. These ferrules were coated with an oil-like substance and it was claimed that air forced around them would lose most of the dust.

That such an air filter could do any good seemed unbelievable. Yet it was the grandfather of all the best air filters of today in that it exemplified the principle that dust, like snow, will fall out of a wind-eddy to leeward of an obstruction. The dust collects behind the ferrules or hairs or glass fibers or snow-fences and the relatively clean air passes on.............

................The SOCIETY always has played a major part in eliminating guess work in the design of heating and ventilating apparatuses and in promotion of health and comfort. Our research activities have been outstanding, in that the Society encouraged participation in research by engineering faculty members of universities, and that it aided in designing laboratories and aided in financing their activities. Our leading members have been notable for giving freely of their time and brains in developing our own researches.

This Society is outstanding, the world over, for the rational development of the basic data for heat transfer, combustion of fuel, conditioning of air for ventilation, control of temperature for heating and cooling, removal of dust, and elimination of smoke................

Chapter Meetings*

• *ARIZONA*: Speaking at the February meeting, Pres. John E. Haines, Minneapolis, Minn., predicted the progress of the heating and ventilating profession in *The Next Ten Years*. He also described the new regional plan. President Haines was introduced by J. B. Hoaglund. Attendance 47. Attendance ratio 0.62.

• *ATLANTA*: Pres. J. M. Lazenby presided at the joint *ASRE*-ASHAE February meeting.

Herb Diffenbaugh, American Blower Corp., spoke on the use of fans in air conditioning and industrial applications of fans. Attendance 95.

• *BALTIMORE*: *Automatic Controls* was the title of a film presented in February by William Law and J. F. Maienshein. In addition to the film, three recording instruments were put on display. Mr. Maienshein answered questions following the presentation. J. K. Wolford, chairman of the program committee, introduced the guests.

Pres. E. H. Taze reported to the members on the Society's 61st Annual Meeting in Philadelphia. Attendance 45.

• *CENTRAL NEW YORK*: L. G. Miller, dean emeritus of engineering, Michigan State College, East Lansing, Michigan, was introduced by D. L. Mills at the February meeting. Mr. Mills called attention to the many honorary societies of which Dean Miller is a member and to his prominence in the field of warm air heating engineering.

Ably presenting his topic, the heating of commercial and industrial buildings with warm air, Dean Miller gave his audience interesting and educational information. He stated that there is a movement afoot in Michigan for the operation of the public schools twelve months each year, rather than the customary nine months, in order to get the maximum benefits from the school buildings now available. Following his address, Dean Miller answered questions from the members present. Attendance 33. Attendance ratio 0.23.

• *CENTRAL OHIO*: Society First Vice Pres. John W. James, Chicago, Ill., outlined the national picture of Society activities at the meeting in February. H. W. Alyea, chief field engineer, Johnson Service Co., Milwaukee, Wis., spoke on automatic control.

Treas. T. R. Walker announced that the treasury was in need of rejuvenation. Motions were carried that a donation be made by all members and that the dues for 1955-56 be raised. Attendance 47. Attendance ratio 0.27.

• *CINCINNATI*: Coffee speaker at the February meeting, A. W. Edwards, entitled his slide presentation *Westward and How!* Mr. Edwards, who was introduced by R. S. Rose, meetings chairman, also reported on the success of the 61st Annual Meeting in Philadelphia.

After adjournment to the meeting room, J. A. Lamb introduced the guest speaker, R. J. McGinnis, editor-in-chief, *Farm Quarterly*, who explained *Why Communism Won't Work*. Attendance 47.

• *CONNECTICUT*: Previous to the February meeting which was held in Waterbury, about 40 members made an inspection tour of the tube rolling mills of the American Brass Co. and were given demonstrations of the methods of extruding copper and brass tubing.

Henry Voegeli, development engineer, American Brass Co., talked at the meeting on the use of the heat pump, following with slides demonstrating its use.

A detailed report on his trip to the 61st Annual Meeting in Philadelphia was given by G. F. Nieske. Attendance 66. Attendance ratio 0.38.

• *DELTA*: A consulting meteorologist, Nash Roberts, was the February guest speaker, introduced by Theodore Offner. Mr. Roberts' talk was to have been *Weather, the Basis of the Air Conditioning Business*. Explaining that this was an understatement, since weather is the basis of everything, he deviated from this topic to discuss more carefully the exact duties of a consulting meteorologist. The talk was highly informative.

Also at this meeting, J. S. Burke, member, Chapters Conference Committee, reported on the 61st Annual Meeting, emphasizing the efforts made to bring the 1960 Annual Meeting to New Orleans. Walter Cooke, alternate member, announced that Mr. Burke had been elected chairman, Chapters Conference Committee, and called for a round of applause. Attendance 67. Attendance ratio 0.33.

• *EMPIRE STATE CAPITAL*: Among the February visitors were many engineers from industrial plants in the area who took part in the question and discussion period following the presentation. M. E. Waddell introduced the speakers, A. Heckman, vice president, Therm-O-Wheel, Inc., Far Rockaway, N. Y. and H. N. Crowell, chief engineer, D. L. Dineen Sales and Service Corp., Jamaica, N. Y. The members agreed that the talks and demonstration with working models made one of their most interesting meetings.

Pres. E. C. Doyle read a letter from L. N. Hunter, retiring Society president, and reported on the Annual Meeting in Philadelphia, outlining the redistricting plan in detail. He also pointed out that, according to the Society's annual report, Empire State Capital is seventh from the lowest in chapter membership and second from the highest in attendance. Attendance 35. Attendance ratio 0.23.

• *ILLINOIS*: The meeting committee chairman, R. O. Nelson, introduced H. H. Yousoufian, research engineer, Air Devices, Inc., New York, N. Y. at the February meeting. Mr. Yousoufian talked on *A Common Sense Approach to Two Modern Air Distribution Systems*. Stressing the fundamental concepts of air distribution throughout, Mr. Yousoufian began with an outline of the requirements for designing a good air jet and followed with the type of motion induced around the jet and the room proper.

In speaking on the performance of continuous strip diffusers, he said that the points to be considered are the turbulence introduced, dispersion and aspect ratio. Slides were used to illustrate how they react when applied to ceiling applications.

The use of strip diffusers for under window applications also was discussed. Wiping exposed areas with conditioned air aids in the reduction of down drafts, according to Mr. Yousoufian.

Circular diffusers and problems involving their use for heating and cooling, including such points as height of the diffuser from the floor, diffusion temperature and discharge air velocity, were covered. All of these were illustrated by specific examples, and methods of correcting faulty installations were recommended.

Rectangular and square diffuser locations were considered and were illustrated by slides using smoke tests that outlined the air pattern.

The speaker emphasized the importance of field testing and measurements. To be useful, the measurements must be properly interpreted, since adjustments made in accordance with such readings may have great effects on the overall system performance, Mr. Yousoufian concluded.

A letter of resignation from J. F. Cummiskey, treasurer, was read by Pres. G. V. Zintel. President Zintel expressed the regrets of the Illinois Chapter on losing such a fine officer, but also congratulated him and wished him God-speed in his new position. A unanimous ballot elected H. E. Anderson to replace Mr. Cummiskey as treasurer. This, in turn, left an opening on the board of governors which Herbert Kreisman was unanimously elected to fill. Attendance 105.

• *INDIANA:* The program chairman, J. M. Teskoski, introduced John W. James, first vice president, Chicago, Ill., as February guest speaker. Vice President James posed the question, *Does Air Conditioning Provide a Healthful Indoor Environment?* At the end of his informative talk, he urged that the ASHAE members, as a part of the heating and air conditioning profession, strive for better comfort, health and economy for the general public.

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*Note: The attendance ratios shown represent the membership attendance divided by the chapter membership. These ratios will be useful as a partial indication of interest shown by local chapter members in various types of subjects programmed by the various chapters and may be useful in deciding on subjects for chapter meetings.

E. B. Katz, president, Purdue Student Branch, reported on visits made by his group to industrial plants and announced a substantial increase in membership. On the same subject, W. L. Kercheval made a plea to all chapter members to submit names of qualified prospects to keep chapter membership at the highest possible number.

Pres. P. O. Patterson called upon I. W. Cotton to report on the research program conducted by the Indiana Chapter on *Steam Consumption of Buildings.* The Committee on Research received the work. Attendance 50.

• *INLAND EMPIRE*: Vice Pres. F. W. Jenkinson, program chairman, introduced H. J. Reeves, who was in charge of the February program. Mr. Reeves presented A. B. Martin, Washington Water Power Co., as guest speaker. Giving a comprehensive coverage of utility companies' problems, Mr. Martin discussed electric heat, heat pumps and the load factor. He also gave a detailed picture of experiments performed in residential heat pump applications.

L. E. Marque, alternate member, Chapters Conference Committee, reported on his trip to the 61st Annual Meeting. Attendance 30.

• *KANSAS*: *New Approaches to the Problems of Home Air Conditioning* were presented by L. C. Ginn, merchandising manager, The Coleman Co., Inc., Wichita, Kan., at the February meeting. Vice Pres. A. B. Newton introduced the speaker, and reported on the Annual Meeting in Philadelphia. Attendance 27.

• *KANSAS*: A brief preview of the program for the January meeting was given by R. S. Lowensohn, assistant chief engineer, O. A. Sutton Corp., Wichita, Kans. This program consisted of a guided tour of the Sutton Corp. factory, including complete inspection of the methods of manufacture. Attendance 71.

• *KANSAS CITY*: Prof. Linn Helander, head, department of mechanical engineering, Kansas State College, Manhattan, Kans., spoke in February on *Downward Jets of Heated Air.* Vice Pres. A. S. Hurt, Jr., presented Professor Helander, who is a Kansas City Chapter member.

The activities at the Philadelphia Annual Meeting and the new regional organization plan were covered by Pres. F. K. Ladewig. J. E. Miller, chairman, special events committee, showed the Chapter members the presentation of beautiful color placards he had shown the Council, inviting them to select Kansas City as the location for the 1960 Annual Meeting. President Ladewig congratulated Mr. Miller and his committee on their exceptionally good work. Attendance 93. Attendance ratio 0.37.

• *MANITOBA:* Future plans for the distribution of gas in Winnipeg were reported by F. W. Satchwill, general sales manager, Winnipeg Central Gas Co., at the February meeting. Mr. Satchwill was introduced by A. W. Moss and was extended the appreciation of the chapter by J. F. Bertram.

Pres. G. T. Christie spoke on his trips to Philadelphia and Toronto. The new regional organization plan was of particular interest. Attendance 25.

• *MIAMI VALLEY:* A discussion of proposed revisions to the state building code at the February meeting emphasized the importance of school codes and their strict application. The safety of children was of primary concern to all. It was pointed out that school codes must still conform to public utility rulings on fuel uses. T. R. Walker urged that the role of technical societies in insuring the safe construction of schools should be continued. D. E. Tullis presided. Attendance 44.

• *MICHIGAN:* M. H. Stern, president and general manager, Auto-Therm Manufacturing Co., Detroit, spoke in February on *Industrial Direct-Fired Space Heaters.* Comparing direct-fired with other industrial heating methods, he discussed the principal design features, the engineering of direct-fired heater installations, and the advantages of this type of equipment. Attendance 64.

• *MINNESOTA:* A standing ovation was given to John E. Haines, Minneapolis, Minn., at the February meeting in recognition of his election as president of the Society. Chapter Pres. J. A. Craig offered his congratulations to President Haines and reported on the Chapters Conference Committee meetings at the 61st Annual Meeting of the Society.

E. F. Snyder, Jr., technical sessions chairman, reported on papers presented at the Annual Meeting. Thirteen papers were given, three by members of the Minnesota Chapter, on air cleaning, heat transfer and solar radiation. F. G. Vogt reported on the Exposition.

Appointment of Wallace Brush, B. J. Mulcahy and B. F. McLouth to act as an auditing committee was announced by President Craig.

At the close of the business meeting, J. S. Locke introduced N. E. Bueter, consulting engineer, Chicago, who spoke on the *Relationship between Engineers, Contractor and Owner.* Attendance 75.

• *MONTREAL:* Temperature, turbulence and time are the three "T's" that govern good combustion, according to R. L. Broad, manager, combustion engineering department, Rochester & Pittsburgh Coal Co. (Canada) Ltd. Secy. S. R. Plamondon introduced Mr. Broad in January when he spoke on *Smoke and Flue Dust Control.* While ably discussing his subject, Mr. Broad also illustrated with slides showing methods of combating smoke production. Attendance 61. Attendance ratio 0.23.

• *NEBRASKA:* A Nebraska Chapter member, H. H. Ulrich, chief smoke regulation engineer, City of Omaha, Sanitation Commission, was introduced at the February meeting by M. F. Stober, program chairman. Giving *A Bird's-eye View of the Los Angeles Smog Problem.* Mr. Ulrich illustrated with moving pictures taken in the Los Angeles area. Attendance 27.

• *NEW MEXICO:* Guest speaker at the February meeting, Pres. John E. Haines, Minneapolis, Minn., covered the events of the past ten years in the Society and in the heating and air conditioning profession and predicted what could be expected in *The Next Ten Years.*

Chapter Pres. J. H. Van Alsburg appointed R. G. Merryman as chairman of the nominating committee, with J. M. Huff as a member. R. W. Haines reported on the Chapters Conference Committee meeting held Philadelphia. Attendance 52.

• *NEW YORK:* E. R. Kaiser, director of research, and T. B. Fenzel, industrial liaison representative, were introduced to those in attendance at the February meeting by Vice Pres. Albert Giannini who presided. Mr. Kaiser gave a brief outline of the present research projects of the Society and explained the objectives of the enlarged program of research planned for the immediate future.

S. C. Segal, general sales manager, Kramer Trenton Co., Trenton, N. J. spoke on the *Application of Air-Cooled Condensers to Large Capacity Refrigeration and Air-Conditioning Systems.* Mr. Segal invited the audience to suggest the topics to be covered in his talk. The speaker indicated that air-cooled condensers could operate anywhere in the United States. He cited the advantages of air-cooled condensers over water-cooled condensers as availability of location, elimination of water line connections, freedom from collection of dirt, low operating and installation costs, and the ability to perform in all extremes of temperature. H. S. Johnson, chairman of the nominating committee, presented his report. Attendance 60. Attendance ratio 0.13.

• *NORTH JERSEY:* Audience participation hit a new high following a provocative talk in February by V. D. Wissmiller, manager, industrial building controls, Minneapolis-Honeywell Regulator Co., Minneapolis, Minn., on thermostatic control of air-conditioning systems through electronic devices. Vice Pres. C. H. Smith introduced the guest speaker.

W. M. Vidulich, public relations director, introduced by Pres. H. M. Patrick, spoke on the attendance and financial success of the 61st Annual Meeting. President Patrick, member, Chapters Conference Committee, outlined the activities of the business sessions at Philadelphia.

A letter from L. N. Hunter, retiring president, read at the meeting expressed appreciation for the Chapter's cooperation.

President Patrick announced appointment of the following nominating committee: A. A. Bearman, chairman, R. A. Lenaz and H. S. Wheller.

• *NORTH TEXAS:* P. N. Vinther, Dallas, Tex., gave a delightful and highly nontechnical report in February on the European trip which he and his wife took last year. During their 108-day tour, the Vinthers occupied 64 different beds and traveled 30,000 miles—3000 miles by air, 8000 by water, 1000 by train, 500 by bus, 7500 by auto, and 10,000 miles on foot. Mr. Vinther's final statistic was the impressive accumulation of 20 lbs. of literature. Ross Zumwalt had introduced Mr. Vinther to his audience.

Secy. G. H. Meffert, member, Chapters Conference Committee, reported on the committee meetings at the 61st Annual Meeting. Attendance 121. Attendance ratio 0.47.

• *NORTHEASTERN OKLAHOMA:* Shock and noise control of air-conditioning equipment was the subject of a talk by D. H. Vance, Korfund Co., Inc., Long Island City, N. Y. at the February meeting. Mr. Vance was introduced by R. E. Pauling.

Pres. J. T. McKinney described the regional redistribution plan.

• *NORTHERN OHIO:* Contracts, both oral and written, were discussed in February by Clarence Snyder, an attorney, introduced by D. S. Healey, Jr. Mr. Snyder emphasized the importance of a thorough inspection of contract papers before signing, since a contract is an obligation binding both parties as written in the terms and conditions.

L. C. Burkes, vice president and Chapters Conference Committee member, reported on the attendance at his Committee's meeting in Philadelphia. Publicity Chairman J. T. Avery requested that members prepare articles for news releases. Attendance 66.

• *NORTHERN OHIO*: The January meeting of the Northern Ohio chapter was presided over by Pres. D. E. Mannen. A proposal by R. D. Wilson, membership chairman, to elect E. R. Kaiser, director of research, ASHAE, to chapter membership, was carried.

Following the business meeting a talk on *High Velocity Air Distribution* was given by C. M. Wilson, general sales manager, Anemostat Corporation of America, New York, N. Y., who stated that air distribution systems of this type should be thought of as *high velocity* rather than *high pressure;* that temperature differentials can be manipulated to reduce fan horsepower; and that savings can be made in building space, field labor and pounds of sheet metal without penalty of an excessive fan horsepower and consequent high operating cost. A question period ended the meeting. Attendance 120.

• *NORTHERN PIEDMONT: Facts about Package Boilers* were presented at the February meeting by J. B. Johnson, regional manager, Industrial Division, York-Shipley, Inc. C. A. Cofer, program chairman, introduced the speaker. An open forum discussion was conducted following the talk.

Pres. S. T. Oliver spoke on the Chapters Conference Committee meeting in Philadelphia. Attendance 24. Attendance ratio 0.13.

ASHAE Pres. John E. Haines, Minneapolis, and Chapter Pres. E. E. Kelly at March meeting of Oregon Chapter

• *OKLAHOMA*: Members present at the February meeting heard C. W. Nessell, account executive, Minneapolis-Honeywell Regulator Co., Chicago, Ill., speak on, *Advances and Trends in Warm Air Heating.*

Mr. Nessell summarized the history of the development and application of warm air perimeter heating and outlined his interesting work with the testing unit of the *National Warm Air Heating & Air Conditioning Association.* Presiding officer was Pres. G. E. Ervin. Attendance 62. Attendance ratio 0.40.

• *ONTARIO*: A talk on *New Avenues of Business for* 1955 by D. G. Willmot, president, Anthes-Imperial Co., Ltd., Toronto, Ont., Canada, was given at the February meeting of this chapter.

The meeting was held at the same time as the Conference of Canadian Chapters of ASHAE, in the Coliseum Building of the Canadian National Exhibition Grounds. The presiding officer was M. C. Bailey. Attendance 410.

• *OREGON*: Society Pres. John E. Haines, Minneapolis, Minn., was guest speaker at the March meeting of the Oregon Chapter, giving an interesting talk on *The Next Ten Years.* His presentation, which was well illustrated by slides, covered the progress of the Society and the heating and air-conditioning profession during the past 10 years, and estimated the projected growth for the next 10 years of the American economy, and the air-conditioning industry in particular. B. W. Farnes, program chairman for the evening, introduced President Haines.

E. E. Kelly, Oregon president, introduced T. C. Caskey, Pacific Northwest Chapter president, who was a guest at the meeting. President Kelly announced the appointment by the Board of Governors of a chapter auditing committee comprised of E. R. Lokey, chairman, K. H. Hanson and H. W. McKenzie.

A unanimous ballot carried the new slate of officers: *President* — Dick Blankenship; Vice President — W. R. Norte; *Secretary* — W. B. Hayes; Treasurer — G. G. Van Alst; *Board of Governors* — J. W. Wallace, Jr., W. H. Oscanyan and E. E. Kelly.

Past President T. E. Taylor was presented with a cake in honor of his birthday. Attendance 78. Attendance ratio 0.44.

• *OREGON*: The 61st Annual Meeting held in Philadelphia was the subject of a group of reports made in February by chapter members who had attended the Annual Meeting. Dick Blankenship covered the work of the Chapters Conference Committee. Some of the technical papers presented were described by W. B. Morrison. J. D. Kroeker related the progress of the Long-Range Planning Committee of which he is a member, and D. L. Benz gave his impressions of the Exposition. B. W. Farnes, member of Council, mentioned the social activities and spoke on some of the plans of the Society's Membership Committee, of which he is chairman.

Secy. K. N. Flocke read the report of the Oregon Chapter nominating committee, J. P. McDermott, chairman. Attendance 53. Attendance ratio 0.30.

• *OTTAWA*: Dr. N. B. Hutcheon, Asst. Director, Div. of Building Research, National Research Council, spoke on *Humidity in Canadian Buildings*, at the February meeting. A member of the Committee on Research, as well as numerous other Society committees, and author of several technical papers, Dr. Hutcheon stated that the Society was considering the revision of the ASHAE Comfort Chart. He explained that current opinions that low humidities are detrimental to health have not been proved. Dr. Hutcheon also itemized the number of normal ways that adequate humidity is maintained inside a house. An extensive question period fol-

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lowed. N. J. Howes, secretary, introduced the speaker. Presiding officer was Pres. W. J. Robinson. Attendance 24. Attendance ratio 0.40.

• *PACIFIC NORTHWEST*: The history of engineering was traced back to its beginnings in a talk by J. D. Kroeker, consulting engineer, J. D. Kroeker & Associates, Portland, Ore., at the February meeting. Speaking on *Long Range Planning and Objectives of the Society*, he pointed out that the ASHAE, from its inception in 1895, was the only society concerned with human comfort. Mr. Kroeker ended his talk by outlining the new regional plan for Society government.

The speaker was introduced by I. L. Winsor, program chairman, who conducted the last part of the meeting presided over by Pres. T. C. Caskey.

• *PHILADELPHIA*: H. A. Lockhart, vice president and chief engineer, Bell & Gossett Co., Morton Grove, Ill. was the speaker at the February meeting presided over by Pres. L. M. Church. Mr. Lockhart, who was introduced by President Church in the absence of Program Chairman C. J. Lubking, spoke on *The Sizing of Expansion Tanks on the Larger Forced Circulating Hot Water Heating Systems*. Attendance 87.

• *PITTSBURGH*: Two members of this chapter, H. L. Moore and P. A. Edwards, were awarded Life Membership certificates at the February meeting presided over by Pres. E. C. Hach.

A panel discussion on *Three Ways of Air Conditioning Multi-Store Buildings* was moderated by R. M. Toucey of the program committee. He introduced H. W. Rainey, Jr., assistant district manager, Westinghouse Electric Corp., Sturtevant Div., who spoke on the conventional low pressure system. J. C. Benson, branch manager, Carrier Corp., Pittsburgh, Pa., spoke next on the high pressure system. He was followed by W. B. Cooper, sales manager, American Radiator and Standard Sanitary Corp., Pittsburgh, Pa., whose topic was the fan coil system. A long question period ended the meeting. Attendance 101.

• *ROCKY MOUNTAIN*: Prof. B. H. Spurlock, Jr., council member, gave a report on the Annual Meeting, and on the council meeting, at the February meeting presided over by Pres. V. F. Vallero. The move was announced, at this meeting, of chapter Vice Pres. F. C. Allen, to Michigan.

Following the formal meeting, E. J. Kurek, research and development engineer, Pyle-National Co., Chicago, Ill. spoke on *Design Considerations in High Pressure Air Distribution Systems*. Mr. Kurek graphically described the unique method of high pressure air distribution using static and velocity pressure relationships at an orifice. He described several such systems. A question and answer period ended the meeting.

• *SACRAMENTO VALLEY*: The presentation in February was made by D. B. Callaway, Industrial Sound Control, Inc., Hartford, Conn. Introduced by R. A. Sarro, Mr. Callaway spoke on *Noise in Ventilating Systems*, illustrating with slides. He discussed the physical nature of sound, its measurement, and how to control it. He stressed the need for more complete data on the noise generated by the various components of a ventilating system, and placed particular emphasis on the need to consider the frequency of the sound if effective means of control are to be found.

Pres. J. E. Marshall reported on the 61st Annual Meeting. Attendance 54. Attendance ratio 0.38.

• *VIRGINIA:* The only business conducted at the February Ladies Night was the election of officers. The following new slate of officers was unanimously elected: *President*—T. B. Carpenter; *Vice President*—R. L. Burton, Jr.; *Secretary*—C. G. Conaway, Jr.; *Treasurer*—D. C. Delinger; *Board of Governors*—W. L. Gibson and Roy Wetherington, Jr. Attendance 53. Attendance ratio 0.45.

• *WASHINGTON, D. C.:* Submarine air conditioning was the topic for February. S. H. Robbins, Jr., introduced the guest speaker, A. S. Gates, Jr., head, dehumidification and submarine air-conditioning sections, Bureau of Ships, Navy Department, Washington, D. C. Mr. Gates discussed design and design problems encountered in air conditioning submarines, the space limitations and the specially designed equipment necessary to meet requirements. The subject created much interest. Numerous questions were asked from the floor.

Vice Pres. W. C. Reamy, Jr., introduced two amendments to the Chapter By-Laws. Pres. G. C. F. Asker presided at the meeting. Attendance 70. Attendance ratio 0.48.

STUDENT BRANCH

• *PURDUE UNIVERSITY:* The Purdue Student Branch, which is now having its most active year in the past five years, has planned a number of inspection tours for its student members. A two-day period of inspection tours in Louisville had already been completed when further plans were announced at the March meeting. At this meeting, the Detroit field trip committee gave a report, and R. E. Jacobs and W. F. Whippo were named as a special committee to make plans for a trip to Indianapolis.

N. H. Garges asked for the members' help in order to present a heating and air-conditioning exhibit at the Purdue Engineering Open House.

An election of officers was held. The following will hold office for the next year: *President*—D. B. Doucette; *Secretary*—J. W. Deabler; and *Co-ordinator*—R. F. Puncochar. Attendance 20. Attendance ratio 0.55.

• *PURDUE UNIVERSITY:* W. F. Whippo reported in February on a field trip which had been made to the American Air Filter Co., Inc., Louisville, Ky.

A new constitution for the Purdue Engineering Council, which represents all of the engineering societies on the campus, was the subject of discussion by Pres. E. B. Katz and the members.

After the business meeting, the group toured the Duncan Electric Co., Lafayette, Ind., with Douglas Flint and Joseph Mugg acting as guides on an inspection of the plant's heating and air-conditioning system. The meeting was adjourned after the tour of inspection. Attendance 23. Attendance ratio 0.72.

Purdue Student Branch Officers (*seated*) D. B. Doucette, president, Prof. F. B. Morse, faculty advisor; *(standing)* J. W. Deabler, secretary, and R. F. Puncochar, coordinator

Candidates for Membership

The Society's By-Laws require that all applications for membership or advancement are to be sent to the Executive Secretary and the names of applicants and their references shall be printed in the next issue of the JOURNAL of the Society, or mailed to all members. When the replies are received from references the Candidate's application shall be submitted to and acted upon by the Admission and Advancement Committee as soon as possible.

When the Admission and Advancement Committee has acted favorably upon a Candidate's application and assigned his grade, the Council shall confirm the election of the proposed Candidate for membership. During the past month there have been 100 applications for membership, including 17 students, 6 reinstatements; in addition 5 advancements have been received. The names of these men and their sponsors are published in the following list.

Members are requested to scrutinize the list with care. The Admission and Advancement Committee, and in turn, the Council, urge members to assume their share of responsibility of receiving these candidates into membership by advising the Executive Secretary promptly of any whose eligibility for membership is in any way questioned.

All correspondence in regard to such matters is strictly confidential, and is solely for the good of the Society, which it is the duty of every member to promote.

Unless objection is made by some member by May 31, 1955, these candidates will be voted upon by the Council. Those elected to membership will be notified by the Executive Secretary immediately after election.

Note: †Reinstatement. *Non-member. △Advancement.

Alabama

BENSON, C. B., Engr., Benson Plumbing & Heating Co., Auburn. REFERENCES: C. T. Cheek, L. J. Drum, Jr., F. K. Hardy, Jr., L. E. Hoene.

Arkansas

BLADES, L. E., Repr., Arkansas Power & Light Co., Little Rock. REFERENCES: R. E. Blaylock, J. P. Cleary, F. L. Cumnock, Herman Cumnock.

California

BERKAN, R. F., Partner, Berkan & Clark Sheet Metal, Carmichael. REFERENCES: D. C. Benbow, J. E. Day, M. J. Delavan, J. E. Marshall.

†CAWBY, E. L., Sales Engr., English and Lauer, Inc., Los Angeles. REFERENCES: F. B. Gardner, G. D. Lord, J. L. McCullough, J. F. Park.

CLARK, C. G., Partner, Berkan & Clark Sheet Metal, Carmichael. REFERENCES: D. C. Benbow, J. E. Day, M. J. Delavan, J. E. Marshall.

COYLE, D. K., Cons. Mech. Engr., Sacramento. REFERENCES: F. E. Hawley, J. E. Marshall, E. C. McKinsey, M. B. Quillen.

FILES, G. H., Pres., Fabling Co., Los Angeles. REFERENCES: L. B. Davenport, L. J. Helms, G. D. Lord, R. E. Thomas.

HEISLER, R. L., Sales Engr., Air Conditioning Supply Co., Los Angeles. REFERENCES: C. L. Corbett, Jr., L. B. Davenport, T. H. Parry, M. D. Shafer.

KINGSTON, V. M., Sales Engr., Service Heat & Power Co., Oakland. REFERENCES: K. F. Baldwin, W. M. Lewis, D. E. McLeod, J. E. Murray.

RHOADS, J. H., Mgr., Air Conditioning Dept., Tay Holbrook, Inc., San Francisco. REFERENCES: J. E. Hedquist, Eric Roberts, L. E. Shea, J. H. Van Dyke.

THATCHER, W. A., Sales Engr., Johnson Service Co., Los Angeles. REFERENCES: J. E. Denton, E. B. Hilton, J. F. Park, R. C. Taylor.

VARVELLO, E. J., Dept. Mgr., Fiberglas Engineering & Supply, Sacramento. REFERENCES: W. D. Kunz, M. B. Quillen, J. L. Sayer*, John Vyverberg*.

WARREN, J. C., Staff Repr., Southern Counties Gas Co., Los Angeles. REFERENCES: N. N. Dahl, H. J. Keeling*, L. B. Rayl, C. A. Sweningsen*.

Connecticut

COTTER, C. J., Htg. Engr., M. J. Daly & Sons, Inc., Waterbury. REFERENCES: S. D. Henderson, W. A. Johnson, J. O. Ostberg, R. M. Ripley.

MILLER, R. L., Air Conditioning Engr., Standard Sheet Metal Works, Inc., Hartford. REFERENCES: H. A. Dyson, A. L. Otis, B. M. Packtor, Albert Spelane.

SHEKETOFF, H. M., Chief Engr., J. P. Salmini Co., Inc., Bridgeport. REFERENCES: C. H. Coogan*, W. A. Ellis, J. J. Fitzgerald, L. J. Wallace*.

Delaware

MORSE, R. W., Project Engr., I. D. Griffith, Inc., Wilmington. REFERENCES: Isadore Director, W. H. Hobbes, Jr., J. J. Hucker, E. G. Ramp.

Georgia

RHODES, W. W., JR., Htg. and Air Cond. Engr., Carrier Atlanta Corp., Atlanta. REFERENCES: L. L. Barnes, J. G. Croley, C. F. Daugherty, Jr., A. E. Rainey.

Illinois

CLOKE, T. H., JR., Chief Piping Engr., Naess and Murphy, Chicago. REFERENCES: J. J. Aeberly, W. S. Bodinus, O. W. Dauber, W. A. Kuechenberg.

△LITWACK, H. E., Partner, Anderson & Litwack, Chicago. REFERENCES: H. E. Anderson, Harry Greg*, L. H. Streb, G. V. Zintel.

MARSH, W. R., Plant Engr., Baxter Laboratories Inc., Morton Grove. REFERENCES: M. J. Bamond, J. A. Dell, P. M. O'Connell, H. G. Swart.

PHILLIPS, J. T., Air Cond. Engr., Leonard Construction Co., Chicago. REFERENCES: M. J. Bamond, R. W. Morgan, L. O. Paul, Hans Stade*.

△PRATT, C. O., Sales Engr., W. C. Morse Heating Wholesaler, Chicago. REFERENCES: H. E. Anderson, J. W. James, H. A. Lockhart, N. W. Swanson.

SIMON, M. S., Sales Mgr., Enterprise Heat & Power Co., Chicago. REFERENCES: S. L. Haas, C. K. Henriksen, Herbert Kreisman, Ernie Vickers*.

SNYDER, D. H., Sales Engr., National Tube Division, United Steel Corp., Chicago. REFERENCES: W. P. Chapman, P. W. Espenschade*, Harry Smith*, J. M. Tulloch*.

Iowa

CRANE, V. L., Mgr., New York Plumbing and Heating Co., Council Bluffs. REFERENCES: C. A. Goth, K. R. Magarrell, Orville Pratt, E. N. Seiler.

Kentucky

BISHOP, H. H., JR., Appl. Engr., American Air Filter Co., Louisville. REFERENCES: John Hellstrom, J. M. Kane, W. J. Killian, C. S. Stock.

STARK, M. L., Dir. of Engrg., Peerless Mfg. Corp., Louisville. REFERENCES: F. W. Brundage, Ed. Hall*, Harold Massey*, W. A. Rockafield.

Louisiana

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Maryland

KLEIN, G. N., Pres., Frank J. Klein & Sons, Inc., Baltimore. REFERENCES: J. H. Baker, G. M. Baldwin, F. W. Bennett, W. J. Latch.

Massachusetts

BEALS, A. C., Maintenance Supt., Marblehead School Dept., Marblehead. REFERENCES: J. A. Ivester, W. G. Martin, Jr., W. N. Murray, G. W. Sprague.

BIANCUCCI, C. A., Chief Draftsman, Hubbard, Tracey and Blakely, Boston. REFERENCES: A. L. Hare, R. E. Reid, G. W. Sprague, R. B. Stevens.

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Journal Section

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Michigan

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Minnesota

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Nelson, L. E., Mech. Engr., Thorshov & Cerny, Architects, Minneapolis. References: J. A. Craig, R. G. Gridley, V. A. Peck, R. L. Peterson.

Mississippi

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Missouri

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Scullion, J. H., Asst. Engr., Burns & McDonnell Engineering Co., Kansas City. References: F. K. Ladewig, R. B. Luhnow, Jr., C. K. Matthews*, A. A. Zahner.

Montana

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New Jersey

Blinsinger, Curt, Owner, Curt Blinsinger, Marlton. References: R. A. Gonzalez, F. B. Millham, J. J. Mirabile, R. K. Thulman.

Bogucz, E. A., Vice Pres., Edwards Engineering Corp., Pompton Plains. References: R. A. Alpert, R. C. Edwards, H. F. Roemmele*, W. A. Vopat*.

Brauner, W. F., Design Engr., E. R. Squibb & Sons, New Brunswick. References: William Caddle, H. A. W. MacNair, J. Z. Peepas, A. M. Truhan.

Garner, S. N., Mgr. & Partner, S. Smith Coal Co. & North East Fuel Co., Kearny. References: J. Bruckner*, D. F. Parker, P. Riskin*, M. Tieger*.

New Mexico

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New York

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Portnoy, Morris, Partner, Schwartz & Portnoy, New York. References: Paul Agey*, A. Corbman*, Martin Corbman*, Ray Edwards*.

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Ohio

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Holcombe, J. R., Mech. Engr., The Austin Co., Cleveland. References: Walter Butler*, Ronald Evans, R. E. Leising, H. S. Price.

Holmes, J. J., Vice Pres., Herbert H. Holmes, Inc., Cleveland. References: J. C. Boehm, Jr., D. S. Healy, C. R. Matthews, R. D. Wilson.

Simon, S. A., Air Conditioning Engr., Feldman Bros. Co., Cleveland. References: L. C. Burkes, D. V. Case, Jr. W. F. D. Neiheiser, H. R. Weiner.

Stachelek, S. J., Mgr., Engineering Services, Owens-Corning Fiberglas Corp., Toledo. References: R. B. Crepps, Robert Greenwald, J. F. Guest, T. S. Rogers*.

△Walcott, R. B., Mgr., Johnson Service Co., Dayton. References: R. W. Kimmel, T. D. Reiley, Fred Spencer, K. A. Wright.

Wood, C. F., Mgr., Residential Air Cond. Product Planning, Frigidaire Division, Dayton. References: R. A. Gonzalez, H. H. Hill, S. F. Shawhan, Herman Worsham.

Oklahoma

Haskins, R. E., Sales Engr., The Trane Co., Tulsa. References: B. W. Clark, F. K. Ladewig, N. H. Peterson, W. L. Walstad.

Oregon

△Marlatt, B. R., Partner, Marlatt's Heating, Eugene. References: W. D. Gutzler, E. F. Kugal, J. P. McDermott, John Stafford*.

Pennsylvania

Brent, A. N., Partner, Albert E. Peters Assocs., Scranton. References: H. K. King, A. E. Peters*, P. H. Weitzel, H. H. Wilson*.

Buckley, F. D., Chief Engr., Gas Cleaning Div., Hagan Corp., Pittsburgh. References: R. B. Engdahl, E. R. Kaiser, C. F. Kottcamp*, G. F. Landgraf.

Koenig, E. R., Sales Engr., Westinghouse Electric Corp, Sturtevant Div., Pittsburgh. References: R. C. Firsching, W. Y. Humphreys, H. W. Rainey, Jr., George Steiner.

Spiegel, W. F., Staff Engr., Charles S. Leopold, Cons. Engr., Philadelphia. References: R. H. Ackerman, F. H. Buzzard, John Everetts, Jr., H. B. Prewitt.

Steiner, P. W., Pres., Steiner-Smith Co., Inc., Drexel Hill. References: R. A. Gonzalez, H. G. McCullough, F. B. Millham, H. E. Sweeney.

Wilkes, L. B., Sales Engr., Westinghouse Electric Corp., Sturtevant Div., Pittsburgh. References: R. C. Firsching, H. W. Rainey, Jr., J. C. Reynolds, Charles Snyder*.

South Carolina

△Bailey, F. A., Jr., Owner, Bailey's, Charleston. References: R. F. Donovan, J. E. McMurray, Jasper Merendino, V. A. Morrow.

Gary, F. P., Owner, Gary Refrigeration Sales & Service, Spartanburg. References: J. K. Centorbe, H. J. Haar, L. L. Hyatt, R. K. Rouse.

Tennessee

Allen, H. E., Mfrs. Agent, T. J. O'Brien Engineering Co., Memphis. References: J. L. Brown, Maury Hughes, Jr., R. E. Larkin, T. J. O'Brien.

†Laughlin, W. C., Vice Pres. & Gen. Mgr., Cook & Nichol Air Conditioning and Heating, Inc., Memphis. References: T. O. S. Humphrey, Jr., R. E. Larkin, H. A. Simpson, H. C. Will.

Pope, B. L., Power Engr., E. I. duPont de Nemours, Chattanooga. References: C. R. Bigelow, S. F. Des Marais, V. H. Hill, M. G. Kershaw.

Smith, Winford, Partner, Garner-Smith Co., Memphis. References: T. O. S. Humphrey, Jr., J. E. Reed, W. E. Thorpe, H. H. Wilson.

Texas

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Binnion, R. C., Sales Engr., The Trane Co., Dallas. References: A. J. Hackl, Fred Manget, M. R. Paulsen, B. E. Priest.

Criswell, D. L., Utilization Engr., United Gas Corp., Houston. References: A. B. Banowsky, R. L. Cook, G. F. Hafkemeyer, C. A. McKinney.

Curry, H. H., Instructor, University of Houston, Houston. References: F. J. Biggi, J. S. Rosebrough, A. R. Sims*, W. H. Willson.

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Rose, T. H., Jr., Secy.-Treas., Rose Bros. Plumbing Co., Irving. References: A. P. Flannes, W. B. Hopkins, R. V. Lentz, J. A. Ray.

Theimer, G. M., Htg. & Air Cond. Promotion Engr., Crane Co., Dallas. References: J. V. Edmondson, A. P. Flannes, R. W. Hanson, I. P. Newby.

Walters, W. K., Br. Mgr., General Controls Co., Houston. References: A. E. Hess, M. E. Linn, D. M. Mills, D. C. McNeil.

Watkins, R. M., Field Appl. Engr., Carrier Corp., Dallas. References: U. D. Bynum*, J. P. Licandro, O. H. Mehl, R. F. Mossman.

Virginia

Siggelin, K. G. A., Chief Engr., Daly, Merritt & Sullivan, Inc., Falls Church. References: R. S. Allen, G. C. F. Asker, A. S. Gates, T. H. Urdahl.

Washington

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Sharkey, W. R., Comm'l. Salesman, Minneapolis-Honeywell Regulator Co., Seattle. References: E. F. Dill, W. T. Scott, R. M. Stern, E. W. Triol.

Canada

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†Cinat, L. J., Acting Asst. Buyer, Simpsons-Sears, Ltd., Toronto, Ont. References: Ted Budynski*, Walter DeAnna*, Orest Duzey*, Albert Ganga*.

Cutler, J. F., Br. Mgr., C. A. Dunham Co., Ltd., Hamilton, Ont. References: M. C. Bailey, James Black, Ernest Fox, F. W. Stott.

Finnan, J. C., Sales Engr., Wagner Electric Div., Sangamo Co., Ltd., Leaside, Ont. References: W. G. Baldwin, R. L. Elsie, W. A. E. Frost, J. L. McLean.

Gallagher, E. S., Sales Mgr., Canadian General Filters, Ltd., Toronto, Ont. References: M. C. Bailey, M. K. Bowman, D. F. W. Carmichael, E. G. Spall.

Greenan, C. P. R., Proj. Engr., Canadian Ice Machine Co., Ltd., Toronto, Ont. References: W. G. Baldwin, R. H. Dyson, J. F. Greenan*, R. T. Tamblyn*.

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Ode, Tadashi, Design Engr., Canadian Comstock Co., Ltd., Toronto, Ont. References: H. W. Butts, W. J. Coates, F. G. Ewens, Harry Huddleston.

Peacock, G. H., Co-Owner, Peacock Heating Co., Toronto, Ont. References: M. C. Bailey, W. M. Flanagan, R. A. Leith, R. A. Ritchie.

Perry, K. J. G., Mgr., Htg. Dept., Crane, Ltd., Moncton, N. B. References: F. L. Armitage, G. L. Ballantyne, R. L. Parsons*, G. K. Pickard*.

Quick, R. F., Cons. Engr., Belleville, Ont. References: L. M. Bennett, J. L. Durrell, R. E. Kinsinger*, J. H. Ross.

Swarbrick, W. J., Asst. Mgr., Engrg. Dept., Fraser Valley Milk Producers Association, Vancouver, B. C. References: D. B. Leany, J. L. Maw, D. W. Thomson, R. C. Tufts.

Italy

Vasta, F. R., Tech. Dir., Icar-Lambda and Air and Light, Rome. References: M. Frankiel*, J. P. Maretto*, H. Weyl*, G. B. Zanetti.

Singapore

Hon, S. Y., Mgr., Kian Gwan (Malaya) Ltd., Singapore. References: K. L. Crapeau*, E. A. Mishler*, N. K. Siang*, T. Siddaway*.

STUDENTS

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Steinman, W. P., Jr.
Tilly, M. J.
Verble, D. E. L.
Wulfe, E. D.

OREGON STATE COLLEGE, Corvallis, Oregon. Certified by: G. E. Thornburgh.

Findlay, J. A.

Certified by: M. B. Larson.

Howard, L. M.
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PURDUE UNIVERSITY, Lafayette, Ind. Certified by: F. B. Morse.

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UNIVERSITY OF TORONTO, Toronto, Ont., Canada. Certified by: F. G. Ewens.

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Mc Bride, D. G.
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VILLANOVA UNIVERSITY, Villanova, Pa. Certified by: J. C. Gregson*.

Santoto, K. H.

OBITUARIES

LLOYD E. SLAWSON
Cleveland, Ohio

Lloyd E. Slawson, 58, president, Slawson Equipment Co., Inc., Cleveland, Ohio, died on March 4, while vacationing in Tucson, Ariz.

Mr. Slawson was born in Plainview, Minn., on June 9, 1896. He attended the University of Minnesota. After working a few years as a draftsman, he joined Minneapolis-Honeywell Regulator Co., Minneapolis, Minn., as a sales engineer, remaining with that company for 11 years. For a few years following, he was in business for himself in Detroit, Mich. He became associated with Barber-Colman Co., in the Electrical Division, Rockford, Ill., in 1935, later transferring to the Cleveland office as manager, temperature con-

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trol department. Mr. Slawson was also connected with the Air Filter Equipment Co., Cleveland, before the opening of the Slawson Equipment Co. in 1948.

A valued member of the Northern Ohio Chapter, Mr. Slawson served on the Board of Governors in 1942. He had joined the Society in 1938. He was also a member of *ASRE*, the *Cleveland Engineering Society*, the American Legion, Lakewood Elks and the Cleveland Athletic Club, as well as being active in several Masonic groups.

Surviving are his wife, Ann E.; a son, Harry C.; two daughters, Mrs. Doris McClave and Janet; four sisters and three grandchildren.

MARK C. DREYER
Aurora, Ill.

Word has been received of the recent death of Mark C. Dreyer, 60, air conditioning engineer and contractor who had his own business in Aurora, Ill.

Born in Fitchburg, Wis., on November 4, 1894, Mr. Dreyer attended East High School in Aurora and the University of Wisconsin. Since 1937, when he opened his business in Aurora, he worked on heating and cooling installations in the area, handling the complete assignment from layout through sales, installation and financing. Mr. Dreyer had been a member of the Society since 1946.

MERLIN J. HAUAN
Seattle, Wash.

Merlin J. Hauan, 53, a consulting engineer associated with Clarence Pangborn, consulting heating and ventilating engineer, died in Seattle on February 17, 1955.

Born in Kingston, Wash., on December 13, 1901, Mr. Hauan was graduated from the University of Washington with a B.S. in electrical engineering in 1925. He started that year with Thomas, Grainger and Thomas, Architects, Seattle, as a mechanical equipment engineer, in charge of planning and supervision of mechanical equipment of buildings. After holding a similar position with John Graham, also a Seattle architect, he began working independently as a consulting engineer from 1932 on.

Mr. Hauan was an ASHAE member for over 20 years. He is survived by two brothers and six sisters. He had resided with a sister, Mrs. Lee Knudsen, Seattle.

E. McLAUGHLIN
Phoenix, Ariz.

The Society learned of the recent death of E. McLaughlin, C. & M. Manufacturing Co., Phoenix, Ariz., at the age of 57.

Mr. McLaughlin was born in Florence, Colo. on February 12, 1897. In 1925, he joined Cooper Gillett Co. as service manager and engineer. Later, he was connected with O. W. Watkins Co. and W. G. Walz Co. For 13 years terminating in 1950, Mr. McLaughlin was owner and manager of the Arizona Engineering Co. He became associated with C. & M. Manufacturing Co. in 1952.

Working in all phases of refrigerating and air conditioning, Mr. McLaughlin had engaged in the design work for the Arizona State Hospital and the Sacatone General Hospital.

WILLIAM B. SCHULER
Rock Island, Ill.

William B. Schuler, sales agent, Rock Island, Ill., died on February 13, 1955. He joined the Society in 1937.

Mr. Schuler, who was born in 1898, had been connected with Taco Heaters, Inc., New York, N. Y., previous to his entry into the Army Air Force in 1942, where he served with the Central Procurement District. While with the Air Force, he inspected heating installations in war plants and checked new installations for approval. He also checked on the need for machine tools to improve production.

Later, Mr. Schuler worked with Products, Inc., Des Moines, Ia. He moved to Rock Island in 1949. He is survived by his wife.

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- **MIAMI VALLEY:** 1950. Hdqrs., Dayton, Ohio. Meets, 1st Wed. PRES., R. W. Kimmel, 320 Loneworth St. (2). SECY., J. B. Rishel, 656 Selma Rd. (9).
- **MICHIGAN:** 1916. Hdqrs., Detroit, Mich. Meets, 1st Mon. after 10th of month. PRES., E. F. Glanz, 1761 W. Forest Ave. (8). SECY., J. H. Spitzley, 1200 Fort St., W. (26).
- **MINNESOTA:** 1918. Hdqrs., Minneapolis, Minn. Meets, 1st Mon. PRES., J. A. Craig, 814 S. Ninth St. (4). SECY., E. T. Erickson, 500 Baker Arcade (2).
- **MISSISSIPPI:** 1953. Hdqrs., Jackson, Miss. PRES., J. E. Davis, Jr., P.O. Box 3216, West Jackson (7). SECY., L. H. Smith, 711 W. Capitol St.
- **MONTREAL:** 1936. Hdqrs., Montreal, Que., Canada. Meets, 3rd Mon. PRES., D. L. Lindsay, 4350 Sherbrooke St. (6). SECY., S. R. Plamondon, 2267 Melrose Ave. (14).
- **NEBRASKA:** 1940. Hdqrs., Omaha, Neb. Meets, 2nd Tues. PRES., C. A. Goth, Omaha National Bank Bldg. (2). SECY., L. J. Paulsen, 1901 S. 39th St.
- **NEW MEXICO:** 1954. Hdqrs., Albuquerque, N. M. PRES., J. H. Van Alsburg, 1330 Cerro Gordo, Santa Fe. SECY., J. K. James, 4462 Avenida del Sol.
- **NEW YORK:** 1911. Hdqrs., New York, N. Y. Meets, 3rd Mon. PRES., R. L. Stinard, 51 E. 42nd St. (17). SECY., Carl H. Flink, 62 Worth St. (13).
- **NORTH JERSEY:** 1952. Hdqrs., Newark, N. J. Meets, 2nd Tues. PRES., C. H. Smith, 2300 N. Stiles St., Linden. SECY., M. C. Christesen, 196 Everett Pl., Englewood.
- **NORTH TEXAS:** 1938. Hdqrs., Dallas, Tex. Meets, 3rd Mon. PRES., J. A. Ray, 4411 Belmont Ave. (4). SECY., G. H. Meffert, 3328 Greenbrier Dr. (5).
- **NORTHEASTERN OKLAHOMA:** 1948. Hdqrs., Tulsa, Okla. Meets, 2nd Tues. PRES., J. T. McKinney, P.O. Box 5145 (16). SECY., G. A. McCune, 1908 Utica Square.
- **NORTHERN OHIO:** 1916. Hdqrs., Cleveland, Ohio. Meets, 2nd Mon. PRES., D. E. Mannen, 9104 Woodland Ave. (3). SECY., H. R. Canoyer, 1900 Superior Ave. (14).
- **NORTHERN PIEDMONT:** 1952. Hdqrs., Greensboro, N. C. Meets, 2nd or 3rd Fri. PRES., S. T. Oliver, 2307 Fairfield Ave. SECY., E. D. Frazier, 320 Ashland Dr.
- **OKLAHOMA:** 1935. Hdqrs., Oklahoma City, Okla. Meets, 2nd Mon. PRES., G. E. Ervin, 2800 N. Oklahoma St. (5). SECY., F. R. Denham, 320 Oklahoma Natural Bldg.
- **ONTARIO:** 1922. Hdqrs., Toronto, Ont., Canada. Meets, 1st Mon. PRES., M. C. Bailey, 1139 Bay St. SECY., H. R. Roth, 57 Bloor St., W.
- **OREGON:** 1939. Hdqrs., Portland, Ore. Meets, Thurs. after 1st Tues. PRES., Dick Blankenship, Cascade Bldg. (4). SECY., W. B. Hayes, 6446 NE 24th (11).
- **OTTAWA VALLEY:** 1952. Hdqrs., Ottawa, Ont., Canada. Meets, 3rd Tues. PRES., W. J. Robinson, 200½ Bank St. SECY., N. J. Howes, Box 264, R.R. 1.
- **PACIFIC NORTHWEST:** 1928. Hdqrs., Seattle, Wash. Meets, 2nd Tues. PRES., T. C. Caskey, 11642—26th Ave., S. (88). SECY., E. W. Triol, 407 Medical Arts Bldg. (1).
- **PHILADELPHIA:** 1916. Hdqrs., Philadelphia, Pa. Meets, 2nd Thurs. PRES., L. M. Church, 12 S. 12th St. (7). SECY., C. J. Forve, Parkwood Manor, Apt. B-202, State Rd. & Penarth Ave., Upper Darby.
- **PITTSBURGH:** 1919. Hdqrs., Pittsburgh, Pa. Meets, 3rd Mon. PRES., E. C. Hach, 221 Broadmoor Ave. (34). SECY., E. H. Riesmeyer, Jr., 231-33 Water St. (22).
- **ROCKY MOUNTAIN:** 1944. Hdqrs., Denver, Colo. Meets, 1st Wed. PRES., V. F. Vallero, 620 12th St. SECY., D. D. Pearsall, 520 Acoma St. (4).
- **SACRAMENTO VALLEY:** 1952. Hdqrs., Sacramento, Calif. Meets, 1st Wed. PRES., J. E. Marshall, 441 Pico Way. SECY., V. W. Thornburg, 2470 27th Ave.
- **ST. LOUIS:** 1918. Hdqrs., St. Louis, Mo. Meets, 2nd Tues. PRES., G. H. Bemarkt, St. Clair Dr., R.R. 1, Caseyville, Ill. SECY., W. P. Norris, 1118 Fullerton Bldg.
- **SHREVEPORT:** 1948. Hdqrs., Shreveport, La. Meets, 3rd Thurs. PRES., J. S. Malahy, Jr., 1839 Line Ave. SECY., H. E. Scott, 2502 Woodford St.
- **SOUTH CAROLINA:** 1954. Hdqrs., Columbia, S. C. PRES., R. F. Donovan, P.O. Box 3053. SECY., J. E. McMurray, 1639 Blanding St.
- **SOUTH TEXAS:** 1938. Hdqrs., Houston, Tex. Meets, 3rd Fri. PRES., J. W. Holland, 245 Esperson Bldg. (2). SECY., J. C. Lewis, Box 8188.
- **SOUTHERN CALIFORNIA:** 1930. Hdqrs., Los Angeles, Calif. Meets, 1st Tues. PRES., C. D. Walz, 3600 San Pasqual St., Pasadena (10). SECY., H. F. Ulovec, 3886 Olympiad Dr. (43).
- **SOUTHERN PIEDMONT:** 1952. Hdqrs., Charlotte, N.C. PRES., L. F. Lawrence, Jr., 212 Greystone Rd. SECY., G. C. Garrett, P.O. Box 3697.
- **SOUTHWEST TEXAS:** 1946. Hdqrs., San Antonio, Tex. Meets, 3rd Tues. PRES., L. H. Hornor, Jr., 816 Insurance Bldg. SECY., Boone Crisp, P.O. Box 9065 (4).
- **TOLEDO:** 1954. Hdqrs., Toledo, Ohio. PRES., F. C. Richardson, Jr., 1938 Shenandoah Rd. (7) SECY., J. F. Guest, 1815 N. 13th St. (2).
- **UTAH:** 1944. Hdqrs., Salt Lake City, Utah. Meets, 3rd Thurs. PRES., A. A. Maycock, P.O. Box 36 (10). SECY., W. L. Stuewe, 1472 S. State St. (4).
- **VIRGINIA:** 1946. Hdqrs., Norfolk, Va. Meets, 3rd Wed. PRES., T. B. Carpenter, 8400 Millard St. SECY., C. G. Conaway, Jr., 4701 Colley Ave.
- **WASHINGTON, D. C.:** 1935. Hdqrs., Washington, D. C. Meets, 2nd Wed. PRES., W. C. Reamy, Jr., 720 Mills Bldg. (6). SECY., S. H. Robbins, Jr., 2009 K St., N.W.
- **WEST TEXAS:** 1953. Hdqrs., Lubbock, Tex. PRES., R. B. Carow, P.O. Box 3206. SECY., H. L. Mayes, P.O. Box 151.
- **WESTERN MICHIGAN:** 1931. Hdqrs., Grand Rapids, Mich. Meets, 2nd Mon. PRES., F. W. Brundage, 512 N. Park St., Kalamazoo (11). SECY., F. L. Murray, 482 W. Michigan Ave., Battle Creek.
- **WESTERN NEW YORK:** 1919. Hdqrs., Buffalo, N. Y. Meets, 2nd Mon. PRES., O. P. Thompson, 260 Richmond Ave. (22). SECY., G. E. Kuhn, 475 Woodland Dr., Kenmore (23).
- **WISCONSIN** 1922. Hdqrs., Milwaukee, Wis. Meets, 3rd Mon. PRES., L. C. Plaehn, 914 N. Broadway (2). SECY., H. W. Alyea, 507 E. Michigan St. (2).

SPECIAL BRANCH

- **SWITZERLAND:** 1952. Hdqrs., Zurich. PRES., H. C. Bechtler, Anemonenstrasse 40 (47). SECY., Walter Hausler, Erbstrasse 2, Kusnacht.

STUDENT BRANCHES

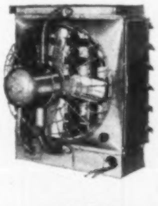
- **NORTH CAROLINA STATE COLLEGE:** 1948. Hdqrs., Raleigh, N. C. PRES., Alvah Ehrman, Box 4502, State College Station. SECY., R. W. McDonald, 1010½ Vance St.
- **OKLAHOMA A. & M. COLLEGE:** 1950 Hdqrs., Stillwater, Okla. PRES., C. E. Durrett, 1215 College. SECY., R. M. Jauch, 308½ W. Maple.
- **OREGON STATE COLLEGE:** 1949. Hdqrs., Corvallis, Ore. Meets, 1st Wed. after 1st Tues. PRES., R. E. Bulletset, 252 Kings Rd. SECY., I. P. Parkhurst, 1354 Harrison.
- **PURDUE UNIVERSITY:** 1948. Hdqrs., W. Lafayette, Ind. PRES., D. B. Doucette, Purdue Student Branch, ASHAE, School of Mech. Engrg. SECY., J. W. Deabler, Purdue Student Branch, ASHAE, School of Mech. Engrg.
- **TEXAS A. & M. COLLEGE:** 1946. Hdqrs., College Station, Tex. Meets, 2nd and 4th Tues. PRES., D. F. Carroll, Box 6264. SECY., C. W. Farrar, Jr., Rt. 1, Box 339, Bryan.
- **UNIVERSITY OF DETROIT:** 1949. Hdqrs., Detroit, Mich. Meets, 1st Tues. PRES., J. C. Rumpf, 16511 Muirland (21). SECY., L. J. Hayes, Jr., University of Detroit.
- **UNIVERSITY OF TEXAS:** 1949. Hdqrs., Austin, Tex. Meets, 1st and 3rd Tues.
- **UNIVERSITY OF TORONTO:** 1951. Hdqrs., Toronto, Ont., Canada. PRES., W. A. Stewart, 86 Roxborough St., W. (5). SECY., R. M. Davies, 144 Manor Rd., E.

ILG
ILG
DIRECT-CONNECTED...MAINTENANCE FREE
Power Roof Ventilators

FOR POSITIVE, CONTROLLED ROOF EXHAUST...

ILG Unit Heaters

The complete line—steam, hot water, gas or electric—with capacities ranging from 18,600 to 286,000 BTU.



ILG Centrifugal Fans

Designed for a wide variety of pressure and volume requirements—certified capacities ranging from 374 CFM to 116,400 CFM.

ILG Propeller Fans

Feature ILG's self-cooled motor, direct-connected to fan wheel—assures extra quiet, low-cost operation. Sizes from 6" to 72".

Year in, year out, rain or shine, Ilg Power Roof Ventilators are always on the job. They provide powerful, positive maintenance-free discharge of stale air or fumes. Designed to meet rigid requirements, they are ideal for the tough ventilating problems encountered in hotels, apartment buildings, office buildings and factories, large or small. The "PRV" unit shown above features a direct-connected centrifugal fan . . . ideal for remote roof operation with double-sealed permanently lubricated ball bearings for exhaust from vertical flues or from duct systems . . . no belts to use up power, wear or break. Available in 40 different capacities. Other types available meet every roof ventilator need . . . all are "capacity certified" in accordance with A.S.H.V.E. and PFMA test codes.

Ilg Power Roof Ventilators Require
No DRIVE or BEARING Maintenance

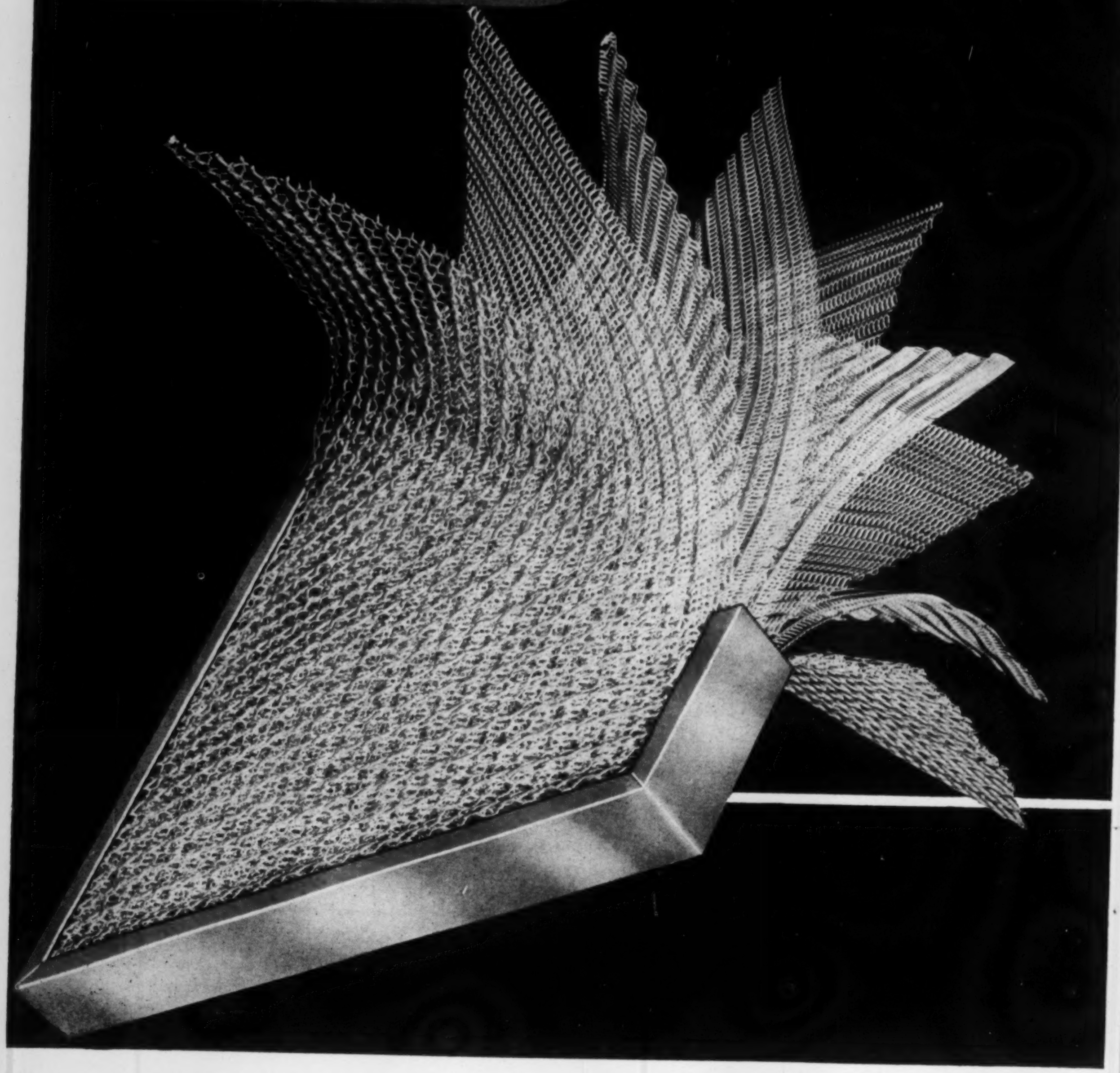
Complete Details . . . FREE

Write today for your free copy of this illustrated Catalog. Ask for Bulletin No. 1903.

ILG ELECTRIC VENTILATING COMPANY
2826 N. Pulaski Road, Chicago 47, Illinois
Offices in 57 principal U. S. cities—all principal foreign cities

WE DARE TO DISCUSS **LINT** *

Evans Lifelong



. . . THE MOST AVOIDED WORD IN AIR FILTERING

AIR FILTERS

*SPECIAL FILTERING ACTION CATCHES AND HOLDS LINT WITHOUT STOPPING AIR FLOW

Make no mistake about it . . . the above statement is not just a claim . . . IT IS AN ABSOLUTE PROVEN FACT. Proven with a test dust that ***contained 6 times as much lint as that generally accepted for filter testing.***

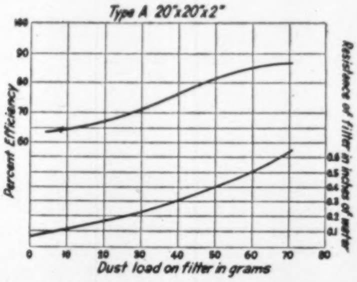
HERE IS THE COMPARISON

GENERALLY ACCEPTED TEST DUST	EVANS TEST* DUST
72% — standardized air cleaner test dust, fine, (Arizona Road Dust, fine)	61% — standardized air cleaner test dust, fine (Arizona Road Dust, fine)
25% — K-1 Carbon Black	21% — K-1 Carbon Black
3% — No. 7 Cotton Linters (percentages by weight)	18% — COTTON LINTERS . . . THESE LINTERS RANGING IN LENGTH FROM 1/8", 1/4", 3/8" and 1/2" WERE ADDED IN EQUAL PORTIONS TO GIVE AN ADDITIONAL 15% LINT TO THE FORMULA.

THIS NEW EVANS FORMULA WAS USED TO PROVIDE A TEST DUST WHICH WOULD BE MORE REALISTIC IN MATCHING EVERY DAY WORKING CONDITIONS.

In addition to using dust with an 18% lint content Evans . . . in order to establish the most grueling possible conditions . . . employed a *continuous feeding process.*

The full amounts of dust were fed into the filter over a period of 2, 3 or 4 hours. (This process was continuous except for a 5 to 10 minute break at the end of each hour which was required to reload dust and fiber feeders.)



THESE EXCLUSIVE EVANS FEATURES MADE THIS PHENOMENAL FILTERING PERFORMANCE POSSIBLE

- PRECISION ANGLED OPENINGS FORCE AIR INTO EXTREMELY HIGH TURBULENCE. CAUSE IT TO TRAVEL 3.5 TIMES DEPTH OF FILTER FROM INLET TO OUTLET SIDE.
- ROUGH, TALONLIKE BURRED EDGES GRIP AND HOLD DIRT AND LINT. FORCE AIR TO TRAVEL OVER 1.24 MILES OF THESE EDGES IN A 20" x 20" x 2" SIZE FILTER.
- NO THICK AND THIN SPOTS. AIR IS PULLED INTO FILTER EQUALLY OVER ENTIRE FILTER PACK SURFACE.
- RIGIDITY OF FILTER PACK ELIMINATES ALL FLUTTER.
- LARGE PRECISION CUT OPENINGS ON INLET SIDE HOLD MANY TIMES MORE LINT WITHOUT STOPPING AIR FLOW. UTILIZE FILTER DEPTH.

AMAZING NEW MERCHANDISING POLICY PROTECTS DISTRIBUTORS, JOBBERS, AND DEALERS

Guarantees this protection. Opens an amazing new field in sales and profits.

If you are now handling an old-fashioned line of filters, which is not giving adequate filtering performance, adequate profits, adequate customer satisfaction and adequate territory protection, then get complete Evans story on both the new lifelong filter and the new merchandising policy.

INVESTIGATE NOW! MAIL THIS COUPON TODAY!

THE GEORGE EVANS CORPORATION, MOLINE, ILLINOIS

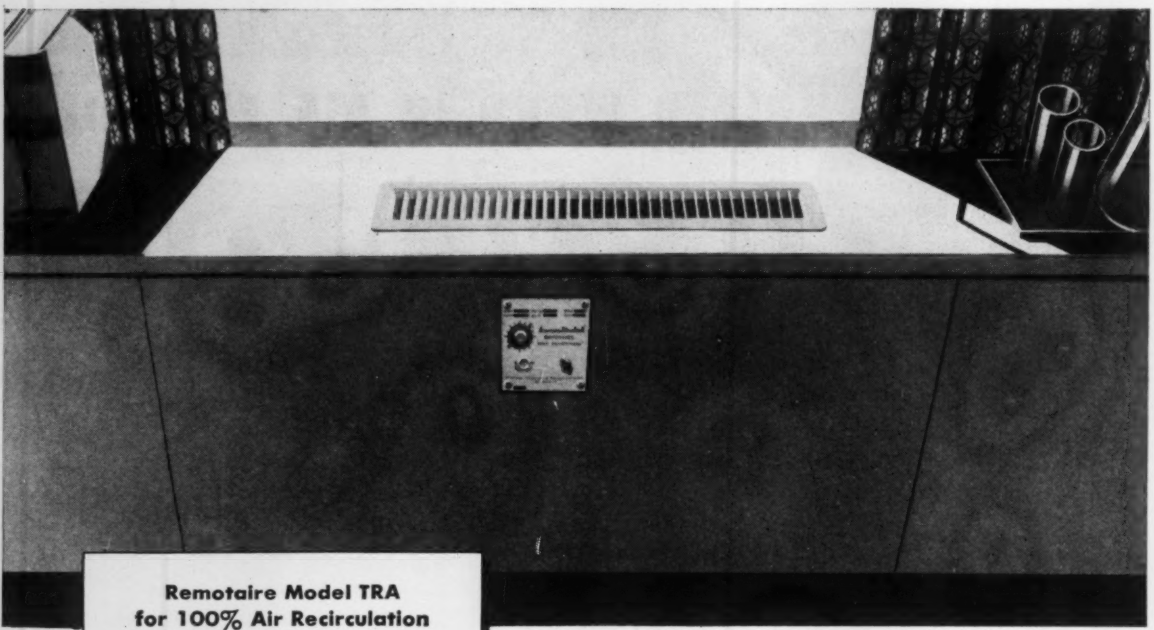
GENTLEMEN: Please send me: ☐ Descriptive Literature ☐ Merchandising Policy ☐ Price Lists

I WANT TO LEARN MORE ABOUT THIS REVOLUTIONARY NEW FILTER DEVELOPMENT.

NAME .... COMPANY ....

ADDRESS ....

CITY .... STATE ....



Remotaire Model TRA for 100% Air Recirculation

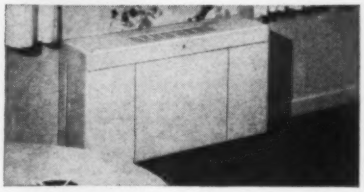
New Remotaire Room Conditioner by American-Standard

. . . specially adaptable to interior ventilation systems

● Now American-Standard Remotaire is more versatile than ever. A new unit—the Model TRA—is designed for cooling and heating the peripheral zone of office buildings, hotels, and other buildings which use interior ventilation systems. Fresh outside air is supplied by small ducts connected to the air conditioning system of the interior zone. These ducts usually are located in furred down ceilings and are connected to small side wall outlets or ceiling diffusers. The interior zone system is designed to provide a mixture of conditioned outside air and recirculated air, or for 100% outside air during intermediate seasons.

Designed for total recessing, the new Model TRA uses a simple piping system that carries hot water for winter heating and chilled water for summer cooling from a central plant. Room air is conditioned all year long!

Available in 200, 300, 400 and 600 cfm sizes, the Model TRA unit has three-speed fan control which provides a wide range of air quantities and heating and cooling capacities. A size for every job!



Look what Remotaire offers:

Every Remotaire unit is listed by Underwriters' Laboratory, Inc., Reexamination Service.

One simple piping system for both summer cooling and winter heating.

Individual room temperature control without affecting adjoining space.

Large filters which keep air fresh and clean.

Drain pan runs the entire length of unit to collect condensation drip.

Coil shield prevents foreign matter from falling into coil.

American-Standard Water Chillers for use with Remotaire Systems are available in sizes from 2 to 75 hp. And for the heating cycle, American-Standard has a complete line of boilers for all heating requirements. One dependable source for a *complete* heating-cooling system.

AMERICAN-Standard
WATER HEATING-COOLING SYSTEMS

American Radiator & Standard Sanitary Corporation, P. O. Box 1226, Pittsburgh 30, Pa.

Serving home and industry: AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS • SUNBEAM AIR CONDITIONERS

Want control for Water Heaters or Heat Exchangers?

call POWERS

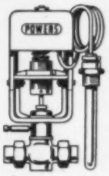
POWERS
FLOWRITE VALVE
TYPE
TO COMPRESS SPRING
TURN

FLOWRITE
One of Powers
Premium Quality
Diaphragm
Control Valves.
They're simple,
sturdy and
dependable.

Over 60 Years of
Temperature and
Humidity Control

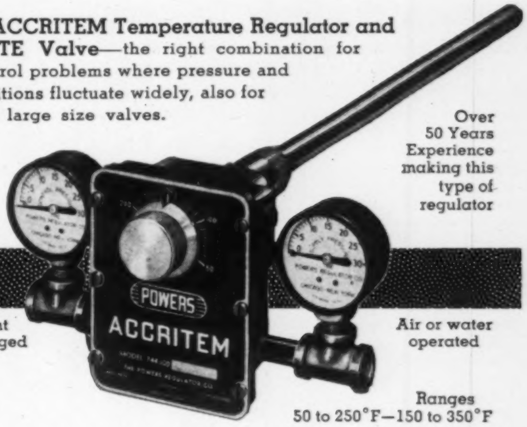
(c28a)

You Will Insure Better Temperature Control IF—



you use the right type regulator and proper size control valve. Whether a simple self-operating regulator shown at left is required or the air operated controls featured here . . . you can get both types and others from Powers. For further information call or write our nearest office.

Powers ACCRITEM Temperature Regulator and FLOWRITE Valve—the right combination for many control problems where pressure and load conditions fluctuate widely, also for control of large size valves.


POWERS
ACCRITEM

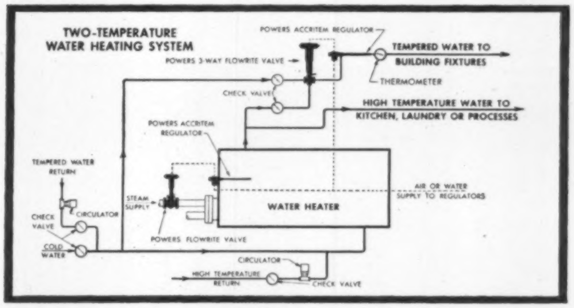
Over
50 Years
Experience
making this
type of
regulator

Control Point
easily changed

Air or water
operated

Ranges
50 to 250°F—150 to 350°F

VALVES: Available in a variety of body types and inner valves.

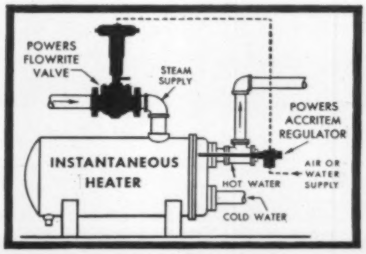

TWO-TEMPERATURE
WATER HEATING SYSTEM
POWERS ACCRITEM REGULATOR
POWERS 3-WAY FLOWRITE VALVE
TEMPERED WATER TO
BUILDING FIXTURES
THERMOMETER
CHECK VALVE
HIGH TEMPERATURE WATER TO
KITCHEN, LAUNDRY OR PROCESSES
POWERS ACCRITEM
REGULATOR
TEMPERED WATER
RETURN
STEAM
SUPPLY
WATER HEATER
AIR OR WATER
SUPPLY TO REGULATORS
CIRCULATOR
CHECK
VALVE
COLD
WATER
POWERS FLOWRITE VALVE
CIRCULATOR
HIGH TEMPERATURE
RETURN
CHECK VALVE

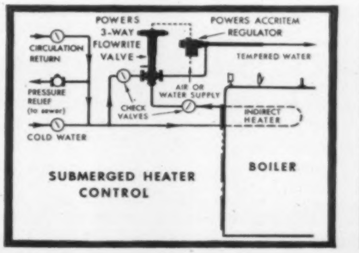
ACCRITEM TEMPERATURE REGULATOR

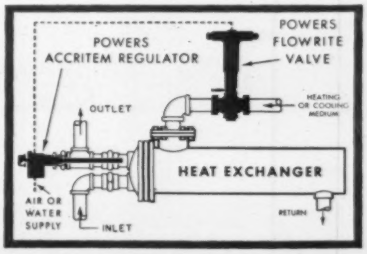
Gives Close Control and Years of Dependable Service.

- Has Adjustable Throttling Range and Calibrated Dial.
- Simple, Durable Construction assures years of trouble-free service.
- Easy to Install • Direct or Reverse Acting, reversible on the job.
- Small Size: Regulator head is 2⅞" wide, 3⅝" high, bulb is 12" long with ½" IPS Connection.

Fully Described in Bulletin 316. Write for a copy.


POWERS
FLOWRITE
VALVE
STEAM
SUPPLY
POWERS
ACCRITEM
REGULATOR
AIR OR
WATER
SUPPLY
INSTANTANEOUS
HEATER
HOT WATER
COLD WATER


POWERS
3-WAY
FLOWRITE
VALVE
POWERS ACCRITEM
REGULATOR
CIRCULATION
RETURN
TEMPERED WATER
PRESSURE
RELIEF
(to sewer)
AIR OR
WATER SUPPLY
CHECK
VALVES
INDIRECT
HEATER
COLD WATER
BOILER
SUBMERGED HEATER
CONTROL


POWERS
ACCRITEM REGULATOR
POWERS
FLOWRITE
VALVE
OUTLET
HEATING
OR COOLING
MEDIUM
HEAT EXCHANGER
AIR OR
WATER
SUPPLY
INLET
RETURN

THE POWERS REGULATOR COMPANY | Skokie, Ill. • Offices in Chief Cities in U.S.A.
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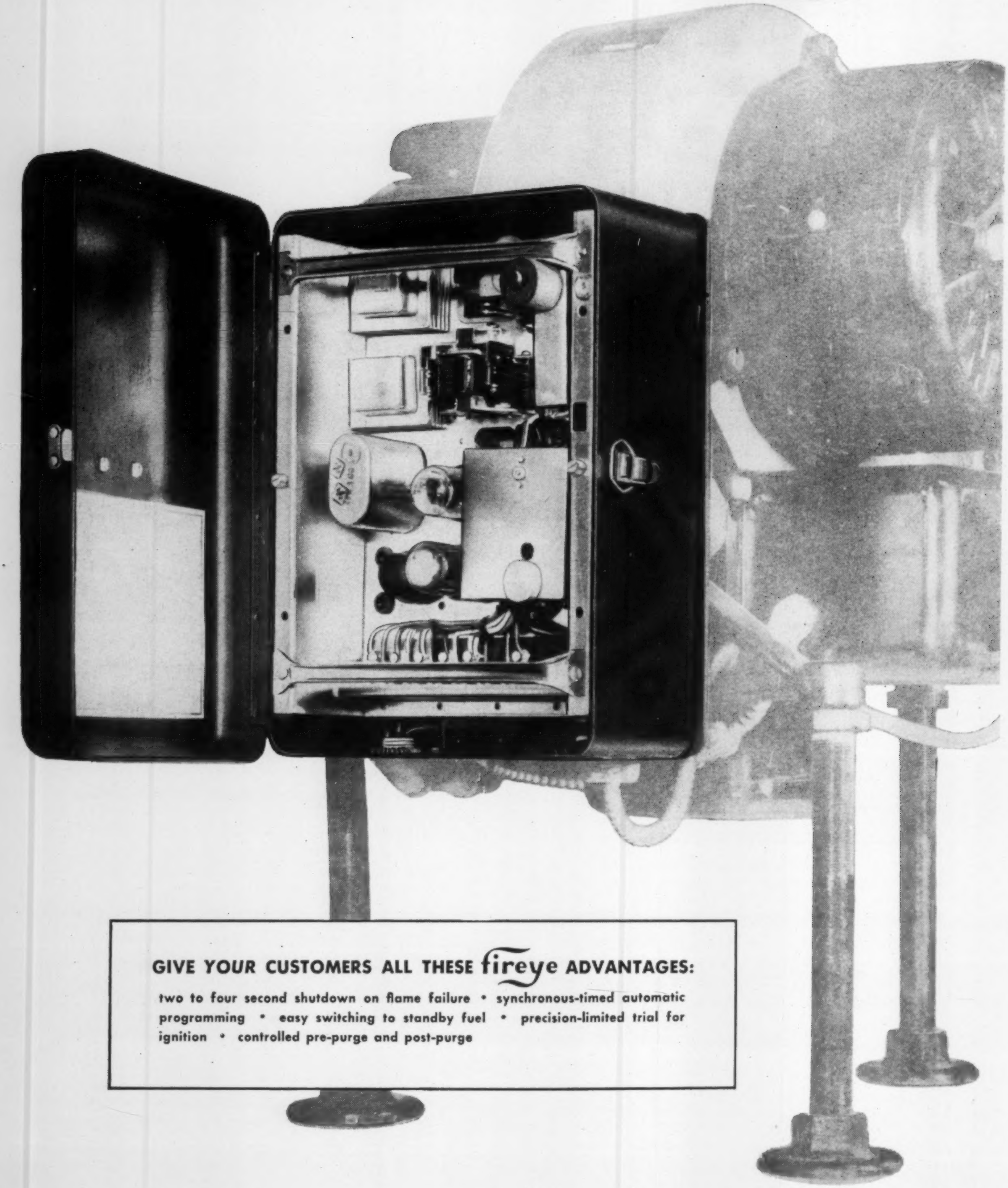
Announcing . . .

A New fireye



GIVE YOUR CUSTOMERS ALL THESE fireye ADVANTAGES:

two to four second shutdown on flame failure • synchronous-timed automatic programming • easy switching to standby fuel • precision-limited trial for ignition • controlled pre-purge and post-purge

Programmer for Commercial Burners

- **meets all latest municipal, state, and insurance code requirements for light oil and oil/gas combination burners**

THE NEW FJ-2 FIREYE is *the* answer to safety codes requiring flame-failure protection on commercial burners to operate positively within *two to four seconds* after the flame goes out.

Only an electronic device can act that fast . . . and only Fireye has proved it can meet these requirements of speed and reliability.

MADE FOR THE JOB . . . the new FJ-2 Fireye is specifically designed for light oil and gas fuels. It literally sees the flame, with the amazingly compact and reliable Firetron scanner. Fuel flow is automatically shut off within two to four seconds, if the flame goes out. Precision timers and relays provide controlled pre-purge and post-purge, and limited trial for ignition.

EASY TO SERVICE, TOO . . . plug-in chassis removes in seconds without disturbing wiring — simplifies installation, maintenance, replacement. Components are of highest industrial quality — withstand moisture, vibration, high temperature — give continuous peak performance. You'll want to give *your* commercial burner customers this complete, dependable protection. Write today for full information.

ECA fireye

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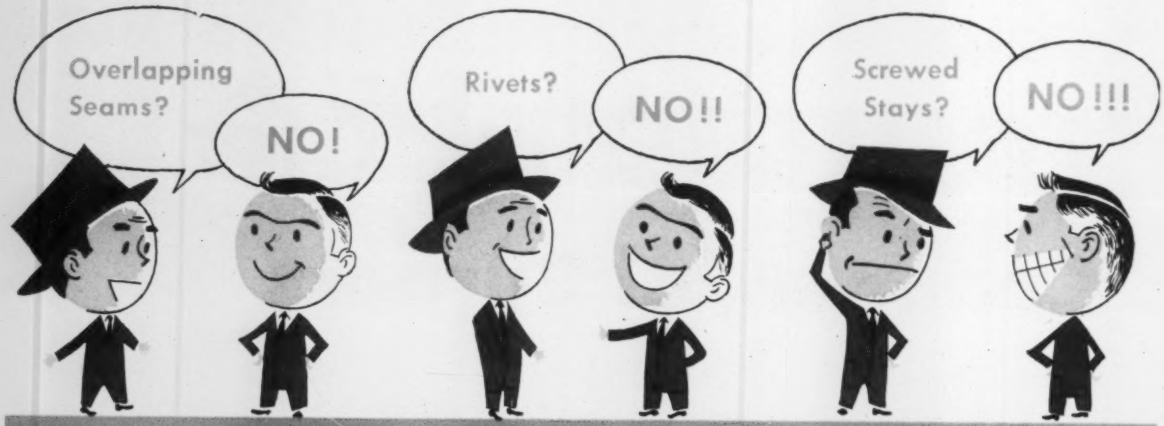
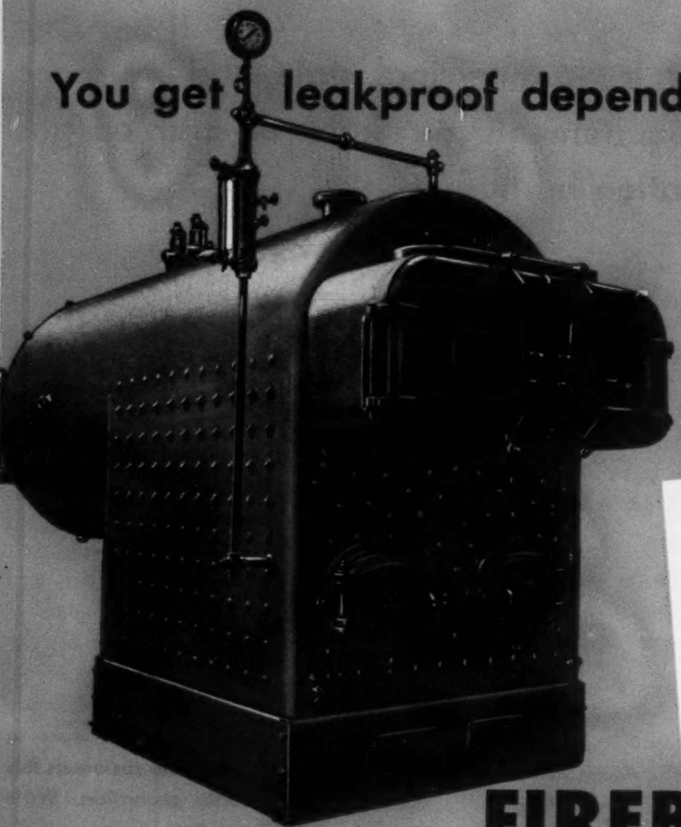

Overlapping Seams?
NO!
Rivets?
NO!!
Screwed Stays?
NO!!!

You get leakproof dependable performance with the

All-Welded All-Around

TITUSVILLE Type WP



FIREBOX BOILER

Twelve sizes to cover service requirements from 25 H.P. to 304 H.P.

Yes sir, you can dismiss leak worries with the Titusville WP—this precision-formed, fusion-welded boiler remains tight under all operating conditions, and is the satisfying answer to your demand for high efficiency and low maintenance at sensible cost. Ask for latest Bulletin B-3030.

TITUSVILLE IRON WORKS CO TITUSVILLE, PA.

THE TITUSVILLE IRON WORKS COMPANY

TITUSVILLE, PENNSYLVANIA

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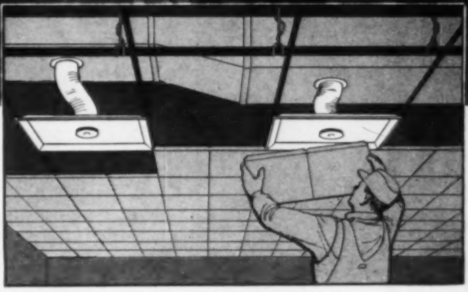
Manufacturers of A Complete Line of Boilers for Every Heating and Power Requirement



True Air Conditioned Comfort with multi-vent®

LOW VELOCITY AIR DIFFUSERS

SPECIFIED FOR FORD...coast to coast

DEARBORN, MICHIGAN
Ford Central Staff Office Building (Illustrated above)
Architects and Engineers: Skidmore, Owings & Merrill New York
Mechanical Engineers: Jaros, Baum & Bolles, New York
Contractor: Bryant & Detwiler, Detroit
Mechanical Contractor: Thermotank, Inc., Detroit

LOUISVILLE, KENTUCKY
Ford Assembly Plant Office Building
Albert Kahn Associated Architects and Engineers

MAHWAH, NEW JERSEY
Ford Assembly Plant Office Building
Giffels & Vallet, Inc.
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Modular Multi-Vent panels will provide a quiet, concealed, draft-free air distribution system in the four new FORD buildings listed at the left.

The Multi-Vent story is simple... this system distributes conditioned air at low velocity by gentle pressure displacement. This unique feature not only eliminates all draft complaints but also allows complete freedom in locating or relocating moveable partitions without repositioning the outlet panels.

Multi-Vent can handle as many as 60 air changes per hour and still maintain even, draftless, low rate of room air motion.

These are only a few of the many reasons why Multi-Vent is the choice of the nation's leading office buildings, hospitals, laboratories, factories, hotels and restaurants.

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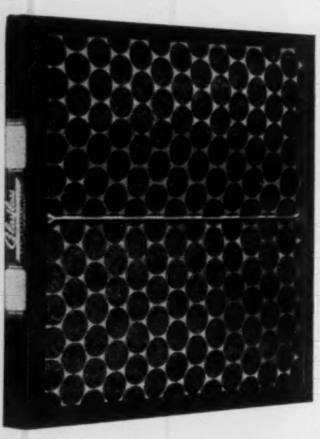
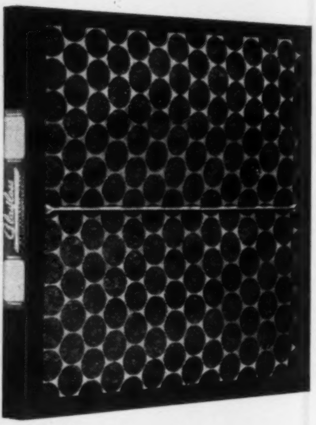
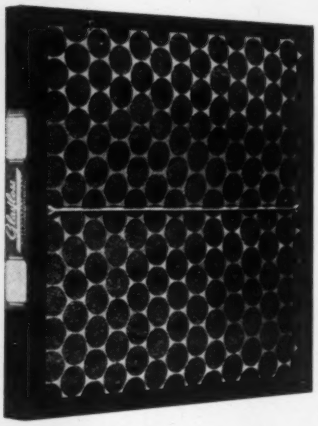
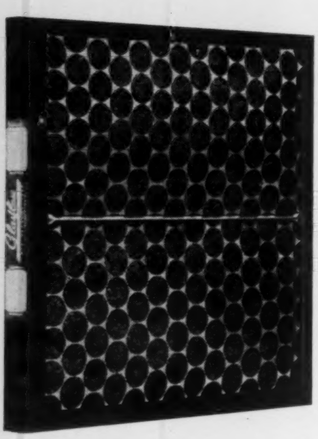
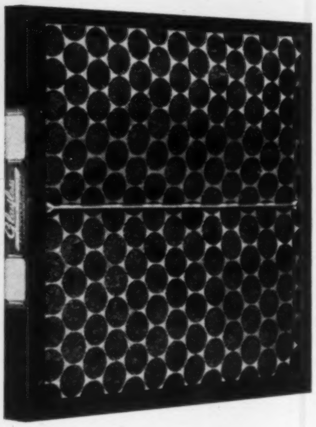


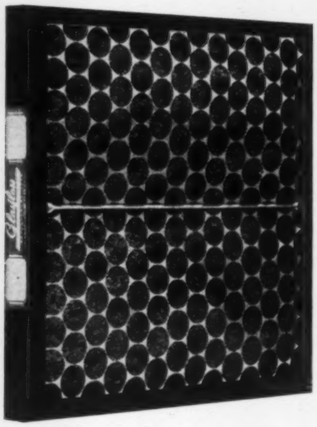




NEW AND IMPROVED AIR FILTERING...







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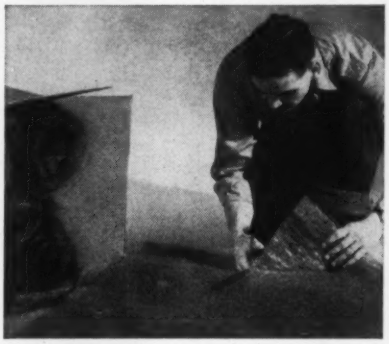
Glasfloss DISPOSABLE AIR FILTERS

The new, extremely fine, silky fibers in Pittsburgh's improved Glasfloss Filters stop and hold more dust—and are easy on the hands!

Available in all standard furnace and air conditioning filter sizes, Glasfloss filter media is also available in Bulk Roll-Paks to provide convenient and economical replacement material for all commercial and industrial filtering uses.

For complete information and prices, write Glasfloss Dept., Fiber Glass Division, The Pittsburgh Plate Glass Company, One Gateway Center, Pittsburgh 22, Pennsylvania.



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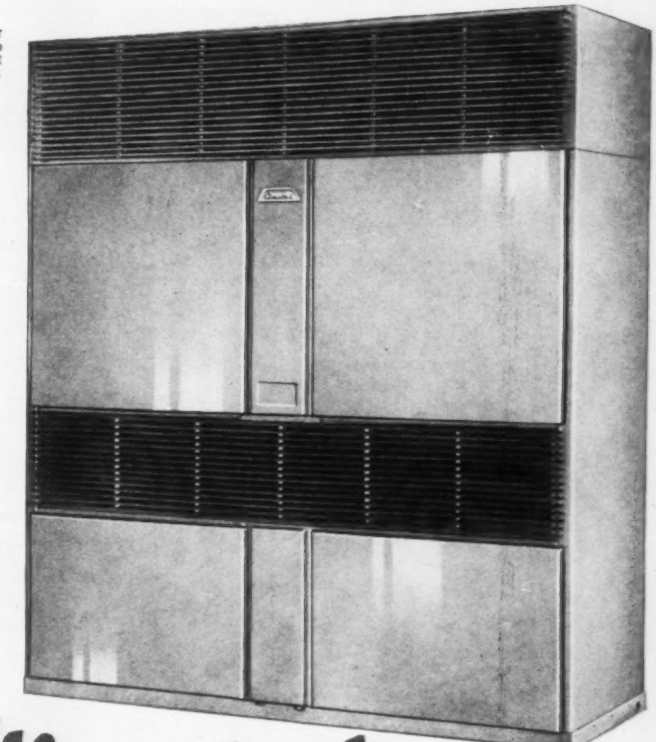
Exterior view of the Mueller Climatrol Type 904-10 and 15-hp air conditioner. Note the smart styling, concealed control panel.



NEW! FOR THE BIG COOLING JOBS

Mueller Climatrol

adds 2 new sizes . . . 10- and 15-hp . . . to its Packaged Air-Conditioner Line

Drawing shows smaller size Type 904 — available in 2, 3, 5, and 7½-hp sizes. Ideal for stores, restaurants, etc. — or with duct systems in homes with radiator or radiant heat.

98th Anniversary

WITH the addition of these two new sizes to the Type 904 line of packaged air conditioners, Mueller Climatrol now gives you a full line to work with — from 2- to 15-hp. These new units are jam-packed with features — take a look.

Type 904-10 — the new 10-hp unit. Smartly styled with a convenient, concealed control panel in front, it stands 98$\frac{9}{16}$" high, 82¼" wide, 31⅛" deep. Uses two 5-hp Worthington compressors, has two shell-and-coil-type condensers and two centrifugal blowers. The refrigerant is Freon 22.

Type 904-15 — gives you 15-hp of cooling. It comes in the same casing as the Type 904-10 and requires the same floor space. However, it uses two 7½ hp compressors, and correspondingly larger twin coils, blowers, condensers. Other features are the same.

Both can be used for year 'round air conditioning — provision has been made for adding either a steam or hot-water coil so that these new units can provide space heating in winter, as well as cooling in summer.

Easy to install — the Type 904-10 and 15 are self-contained and come from the factory completely charged and prewired for easy installation.

There's money in the big cooling jobs — so go after it with Mueller Climatrol to make more sales and to add to your reputation as a *comfort expert*. Write for complete data on these units. Mueller Climatrol, Dept. 155, 2023 W. Oklahoma Ave., Milwaukee 15, Wisconsin.

D-188

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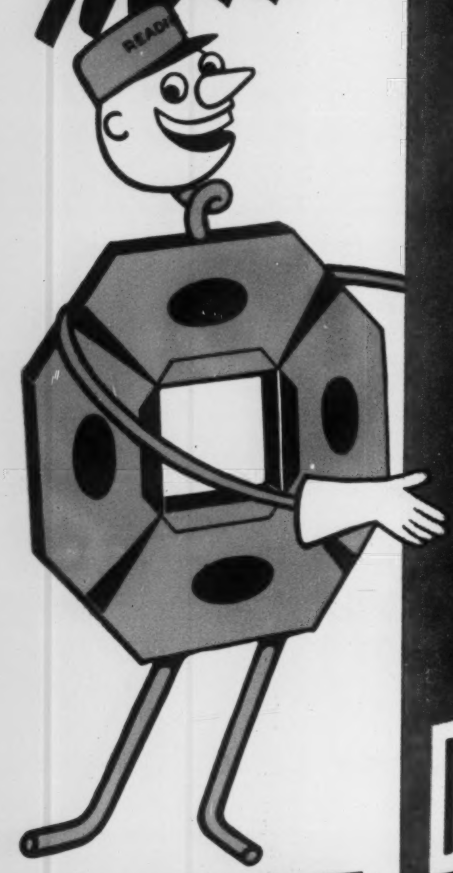

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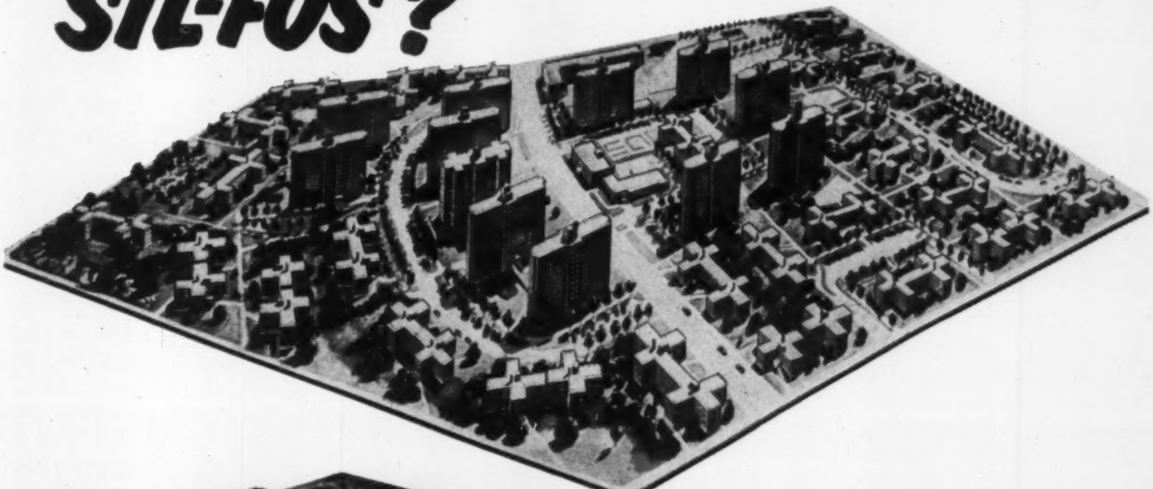
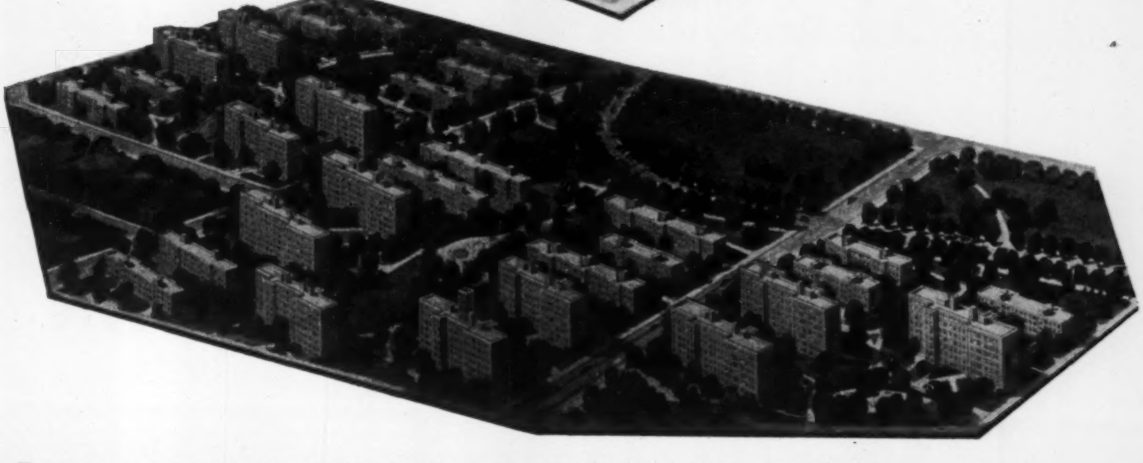
WHY were all water lines in these low-cost housing projects silver brazed with SIL-FOS?





THESE TWO NEW PROJECTS in New York City's low-cost housing program comprise some 4000 apartments in 70 buildings.

WHY did the plumbing contractor elect to silver braze all hot and cold water lines with the low-temperature silver brazing alloy SIL-FOS?

The answer to that question is of vital interest to all plumbing contractors—especially those who have not as yet done any silver brazing of pipe and tubing. It comes direct from the plumbing contractor on both projects—one of the largest and most successful in the business—Eugene Duklauer, Inc.

IT'S IN THIS BULLETIN

Pipe and Tubing Issue

It gives you Duklauer's eye-opening answer together with some interesting views of the piping and other valuable information about silver alloy brazing of pipe and tubing. Write today for your free copy. Ask for Low-Temperature Brazing News No. 61.

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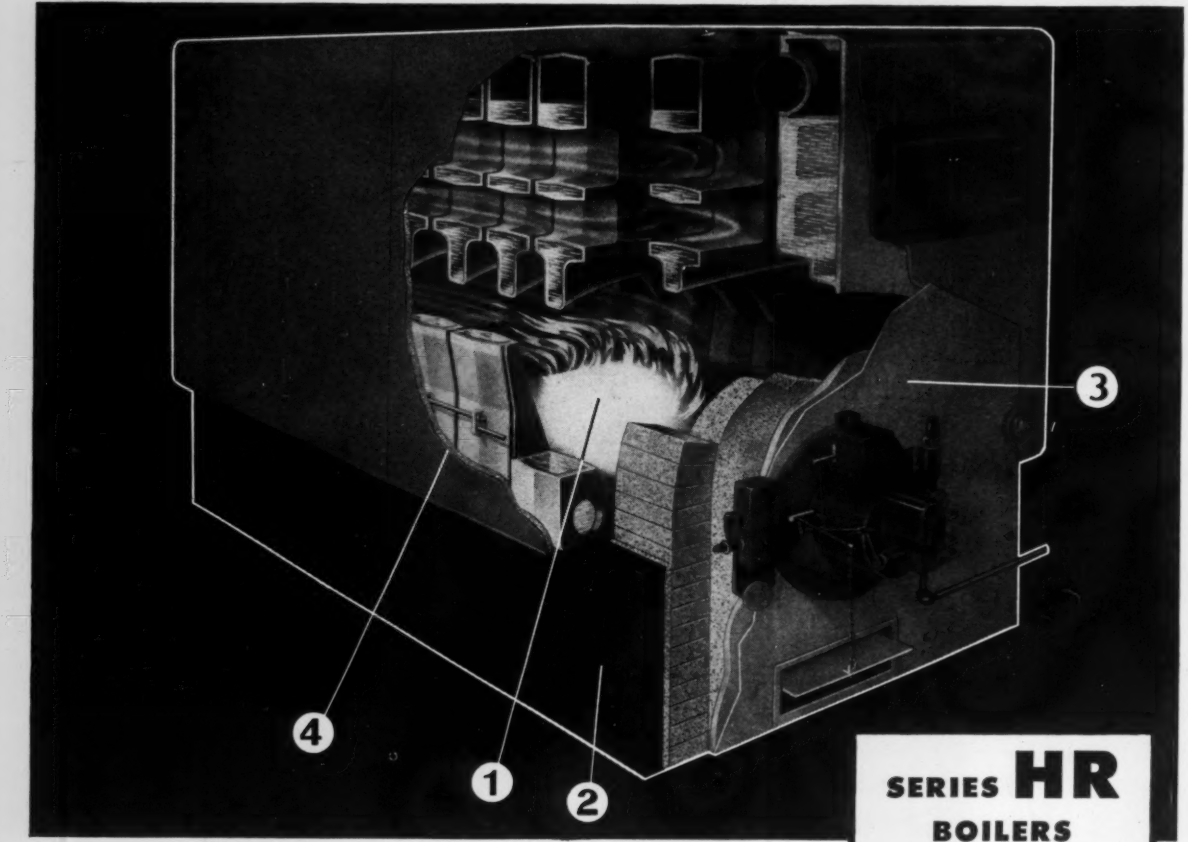
THE FIRST *CAST IRON* BOILER DESIGNED SPECIFICALLY FOR HORIZONTAL ROTARY OIL BURNERS!



SERIES HR BOILERS FOR BURNERS USING HEAVY OILS

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FEATURES!

1. Large fire box volume develops better combustion conditions and maximum radiant heat transfer.
2. High base makes more combustion space available—eliminates high brick foundation.
3. Special steel front plate simplifies installation of rotary burners. Openings can be cut at factory for specific makes.
4. Green enameled steel jacket lined with thick blanket of fibre glass—saves insulating time.

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PRESENTS A HEAVY DUTY BOILER DESIGNED IN COOPERATION WITH LEADING MAKERS OF ROTARY OIL BURNERS

In the "HR Series," Weil-McLain makes a revolutionary advance in boiler design...an ASME constructed *cast iron* unit engineered to provide the best operating conditions for horizontal rotary oil burners!

The cut-away above illustrates the major features which make the "HR" completely outstanding in performance when fired with burners using heavy oil.

Note also the other Weil-McLain features which contribute to exceptionally high overall efficiency. The curved primary heating surface increases the area directly over the fire...large waterways assure rapid circulation...back and forth, balanced flue gas travel distributes heat equally to all secondary heating surfaces...sectional construction with short draw-rods simplifies erection.

Get the facts—write today for complete engineering data.

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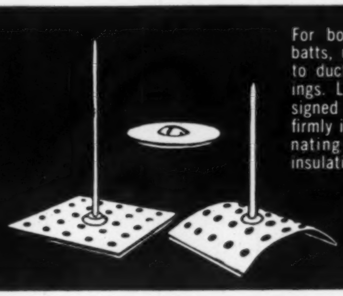
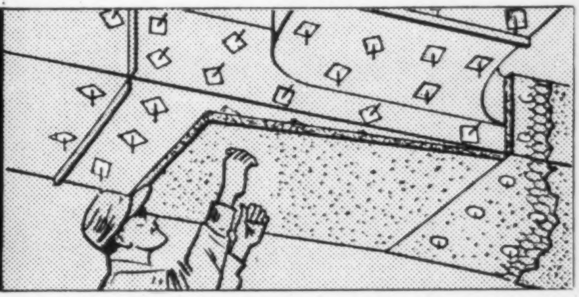
Eliminate drilling, welding, expansion bolts! Reduce time, construction, and installation costs! No damage to surfaces in event of installation removal!

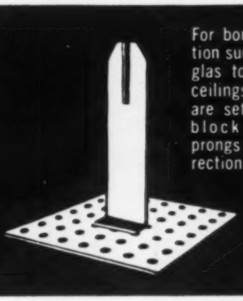
Use Miracle Surface Anchors to provide firm support for block, board or blanket types of insulation on clean rigid surfaces. (Use for conduits, pipes, and fixtures, too.) Also to provide anchorage in otherwise inaccessible locations.

Miracle Surface Anchors consist of perforated metal plates, 2" x 2" or 2¾" x 2¾" to the center of which is welded a spindle, prong, nail, bolt, or threaded stud, zinc plated, with dichromate finish after manufacture. Perforated base provides anchorage by bonding with Miracle Anchor Adhesive to masonry, metal, plaster, etc.

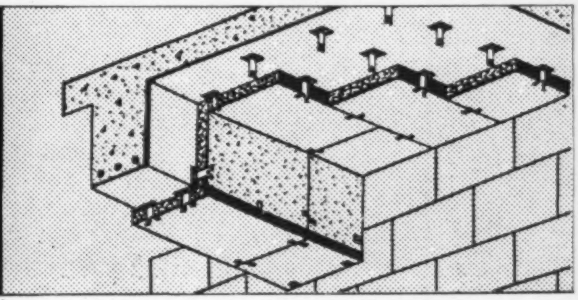


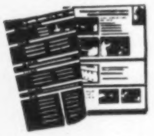
For bonding fiber glass, batts, mineral wool, etc., to ducts, walls and ceilings. Lock washer is designed to hold insulation firmly in place thus eliminating delamination of insulation.





For bonding block insulation such as cork or Foamglas to ducts, walls and ceilings. Pronged Anchors are set between rows of block insulation and prongs bent in reverse direction over blocks.





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it's a matter of people . . .

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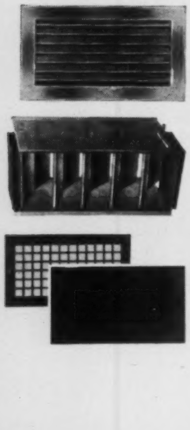

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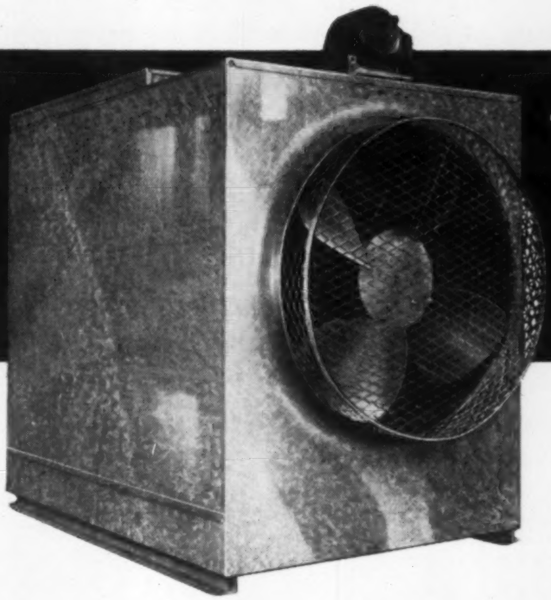
Dover Stops Rust Cold!



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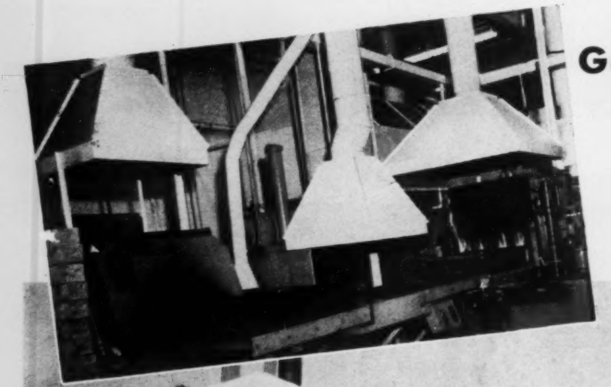
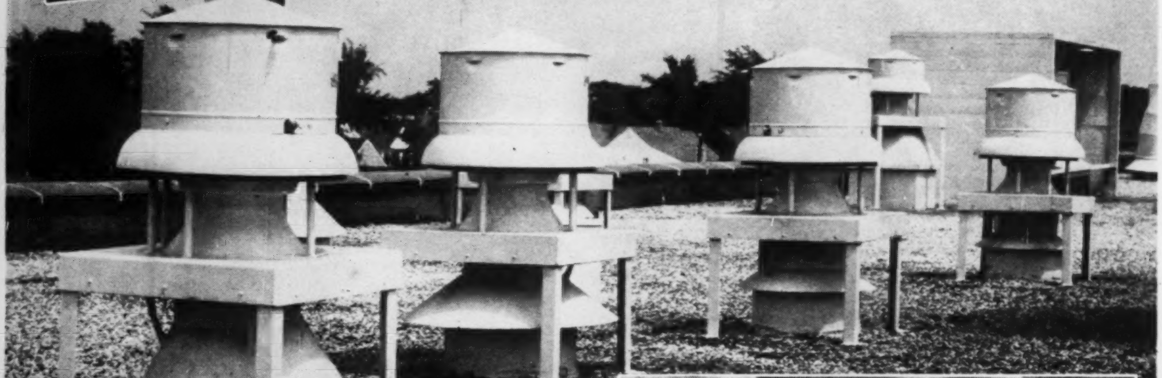
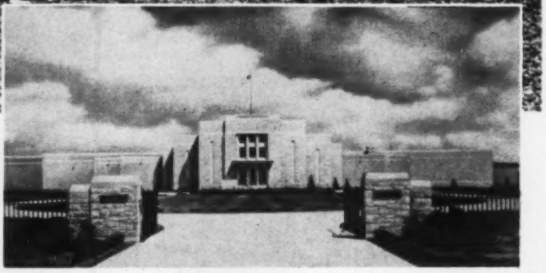


Gallaher Air-Vans®

Help Woodward Governor Beat Electric Furnace Heat



The Woodward Governor Company of Rockford, Ilinois, pioneers in the manufacture and developement of hydraulic governors for prime movers. Many of the world's best known military and commercial aircraft are equipped with Woodward Governors.



In heat treating rooms of the Woodward Governor Co., Rockford, Illinois, manufacturers of hydraulic governors for prime movers, electric furnaces operate at temperatures of 1800-2200 degrees Fahrenheit. Because the plant is completely windowless, there has to be an effective ventilating system.

Del Zeigler, plant engineer at Woodward, specified eight Gallaher direct drive Air-Vans® to exhaust the smoke and other fumes from the electric furnaces and to maintain the proper ventilation in the heat treating rooms. Without the Air-Vans®, the room's temperature would soar to 150 degrees. With Gallaher, Woodward's employees enjoy a comparatively cool seventy-eight degrees. Zeigler reports that these Gallaher units "are very efficient and entirely satisfactory."

Engineers everywhere are turning to Gallaher to solve their ventilation problms, because Gallaher relies on accurate physical tests — not theoretical extrapolations. Such features as the patented built-in scroll effect design and air seal-off, low silhouette, low noise levels, availability in special metals, and weatherproof design make Gallaher a recognized leader in the ventilation field.
Direct Drive units 150-11,000 CFM. Belt Drive 3500-65,000 CFM, developing static pressures to 4".

Patents 2188741 2526290
Patents pending

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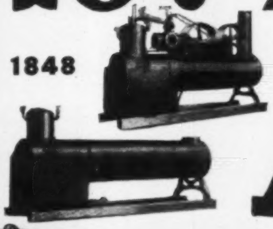
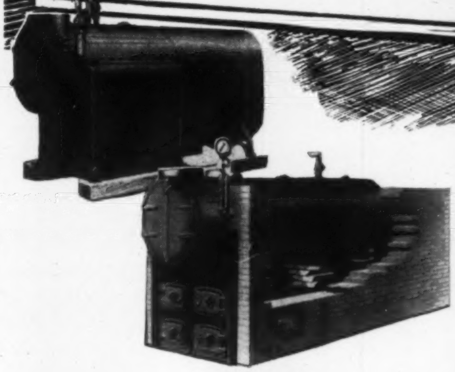
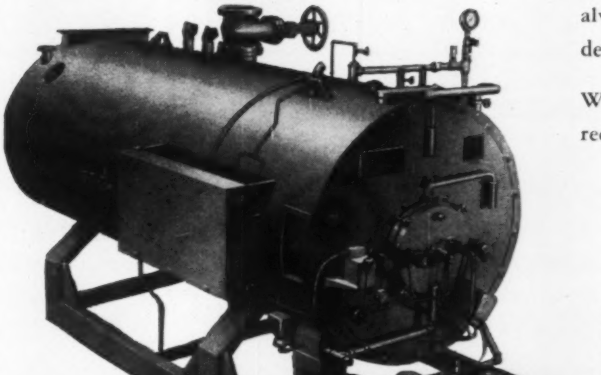




In your selection of a boiler, it's important to remember — experience *does* count. And what better assurance of top boiler quality do you have than the Ames record: 107 years of building fine boilers — boilers which have given economical, satisfactory service throughout the industry! Many Ames units purchased 40 to 50 years age are still faithfully on the job. Amesteam Generators always incorporate the latest advances in package boiler design.

Write today for details on these boilers with the proven record of reliability.



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20 sizes, 10 to 600 H.P., 15 to 200# W.P., oil, gas, or oil-gas combinations with quick fuel switchover feature.

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See how All-Air High Velocity units **lower the roof**

NATIONAL BANK
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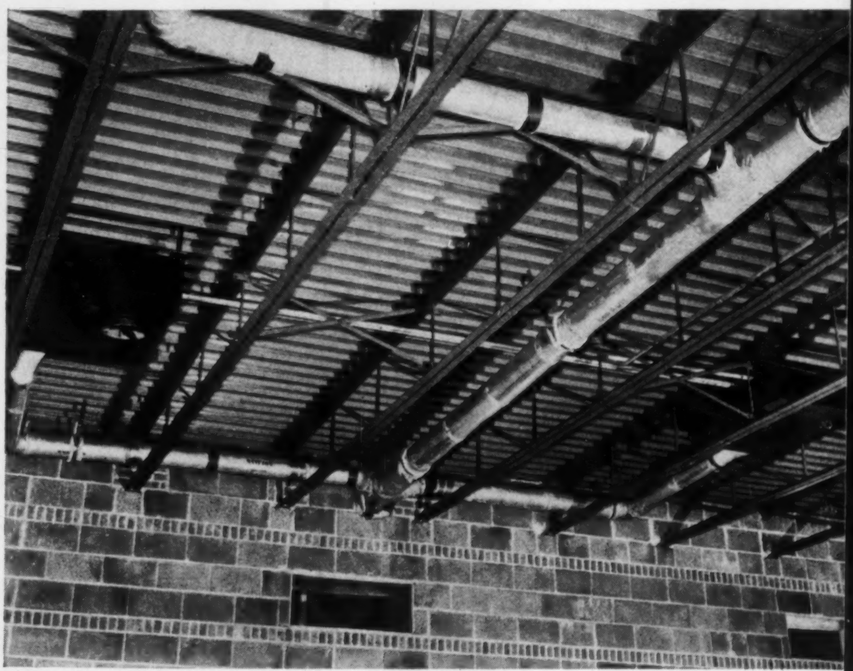
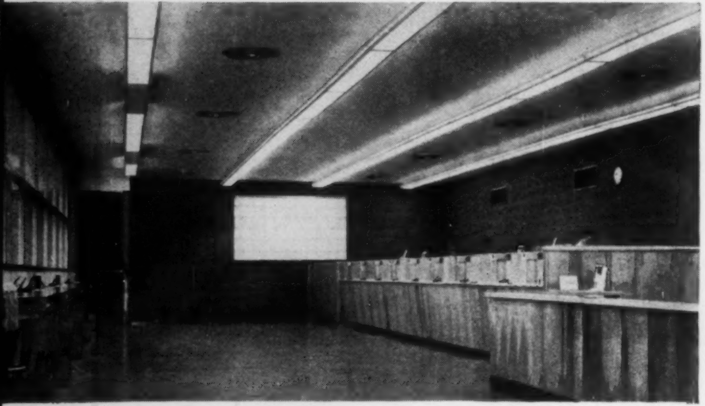
SERVICE

The National Bank of Detroit, which is equipped with an Anemostat All-Air High Velocity distribution system.

This photograph shows the high velocity ducts installed *through* the open web joists. Note how the Anemostat sound attenuation unit is also placed *inside* the open web joist area. As a result, the architects and engineers were able to save *nearly two feet in a one-story building* . . . also make comparable savings in construction costs.



Completed interior with the Anemostat High Velocity units installed in the ceiling.

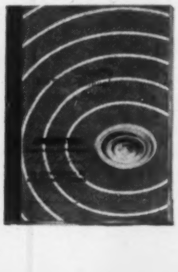


- *Architect:* W. ROY AKITT
- *Engineer:* F. A. SANDO
- *Mechanical Contractor:* JOHN M. CAMPBELL, INC.
- *Ventilating Contractor:* AUTOTHERM CORP.

• *For latest data on All-Air High Velocity units,* write on your business letterhead for *new Selection Manual 50* to Anemostat Corporation of America, 10 E. 39 Street, New York 16, New York.

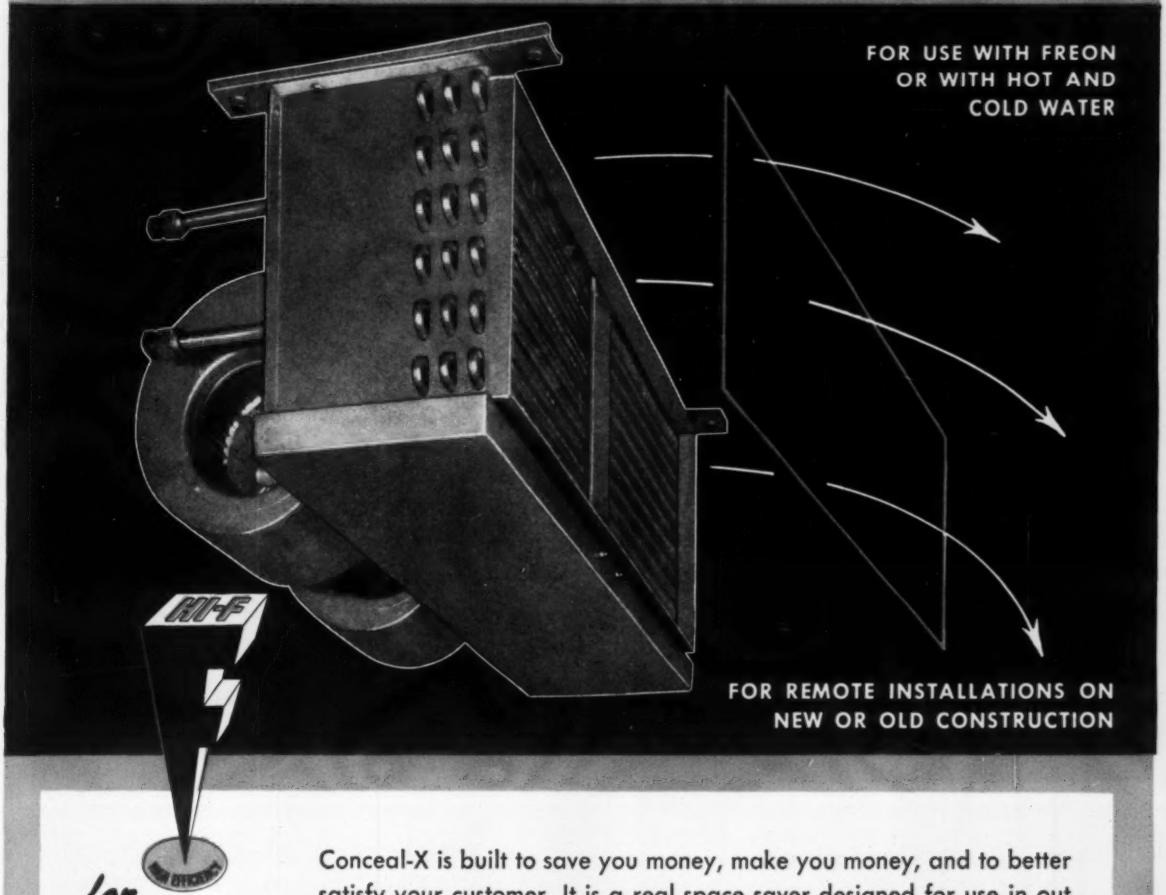
Facts about All-Air HV units

- Can be used with smaller than conventional ducts.
- Can be installed through open web joists (as shown here) and in many other space-saving applications.
- Can be installed faster and with less cost.
- Require no coils, thus eliminate clogging and odors.
- Round, square and straight line diffusers with high velocity units are adaptable to a wide variety of architectural designs.



CONCEAL-X

THE NEW AIR CONDITIONING UNIT THAT REQUIRES NO FLOOR SPACE



FOR USE WITH FREON OR WITH HOT AND COLD WATER

FOR REMOTE INSTALLATIONS ON NEW OR OLD CONSTRUCTION

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HOTELS
HOMES
OFFICES
HOSPITALS
and
General Buildings

Conceal-X is built to save you money, make you money, and to better satisfy your customer. It is a real space saver designed for use in out of the way places and with the capacity to do a big job *quietly*. Recommended for motels, dwellings and buildings for Winter-Summer air conditioning. Conceal-X, installed in vestibules, overhead entrance ways, plenums, closets or hallways with or without false or furred ceilings, provides horizontal discharge to one or several adjacent rooms. Best of all, Conceal-X incorporates the Peerless patent-applied-for Hi-F finned construction that gives you greater B.T.U. efficiency year after year. May we send you bulletin and specifications?

PEERLESS OF AMERICA, INC.

MANUFACTURERS OF REFRIGERATION AND AIR CONDITIONING COILS SINCE 1912

Dept. H, 5830 N. PULASKI ROAD, CHICAGO 30, ILL., U.S.A.

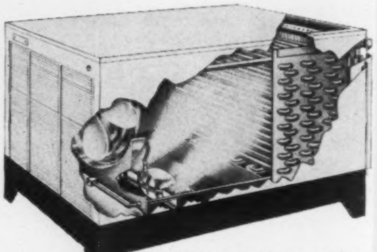
Love
Mother
Shivers
Texas
WALKIN' SHORTS

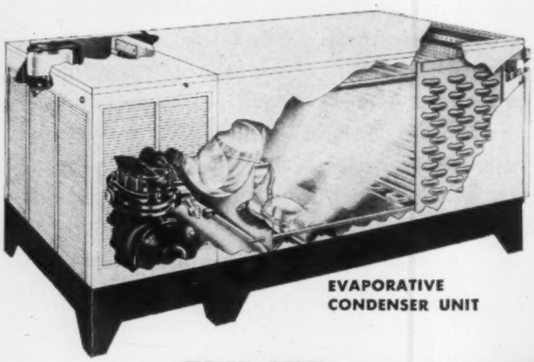
Original Equipment Manufacturers . . .

it takes dern special equipment to keep a TEXAN cool!*

* Yessir, it takes a mighty good piece of air conditioning equipment to cool a Texan in July. And if it'll cool a Texan, it'll cool anybody, anywhere! 'Cause Texas is the hottest place in this world or the next.

How you gonna know whether your equipment will stand up under fierce Texas heat? The best way we know is to use a Cobell "Aqua-Fog" Evaporative Condenser or Condensing unit with your equipment. We build Aqua-Fog right here in Texas, we test it here in Texas . . . and it keeps us cool here in Texas**. And that means it'll hold up *anywhere,* from Phoenix to Yonkers, and Las Vegas thrown in on the side. And you just can't ask for any better than that! ** We're the coolest!


EVAPORATIVE CONDENSER


EVAPORATIVE
CONDENSER UNIT

Aqua-Fog is a new, different system

Cobell gives you a brand new evaporative condenser that combines forced air and water spray to achieve an exceptional degree of rapid heat transfer. Very good for small central units of two to five tons.

Eliminates water cooling tower.

Slashes water consumption up to 97%; no worry about water shortages.

Cuts power costs through reduced head pressure.

Saves space; locate it indoors or out.

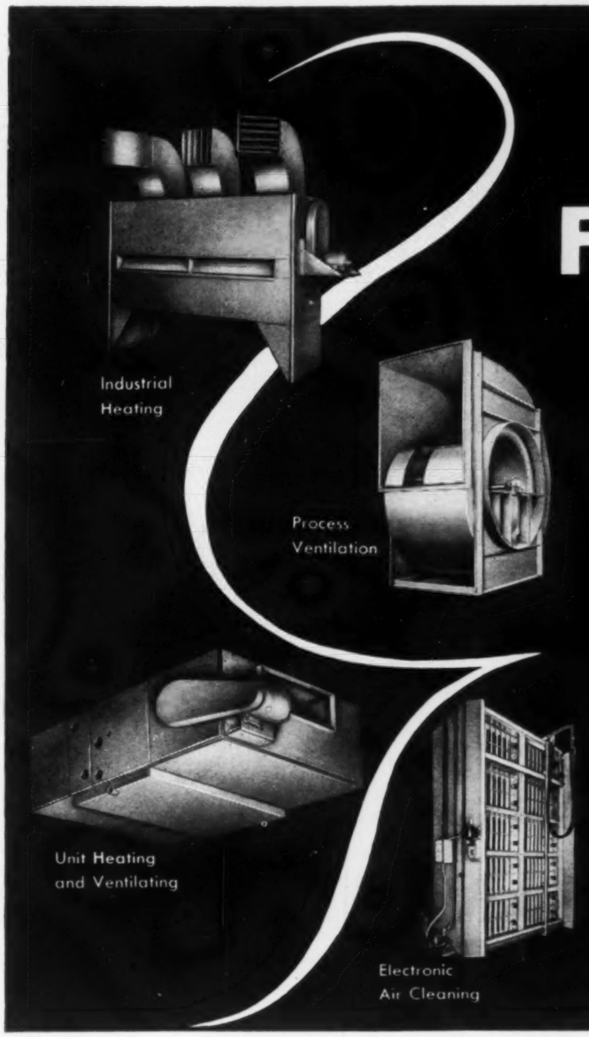
Easy to install, service.

Available with or without compressor, compartment, specified to individual needs.

FIND OUT how you can make money by using Aqua-Fog with your equipment.

WRITE FOR detailed catalogue information.

COBELL
INDUSTRIES, INC.
Box 1157 Ft. Worth 1, Texas



Fact:

Westinghouse Cleans, Heats, Distributes 5,120,000 CFM of Air at U.S. Steel's Giant Fairless Works

Westinghouse has made the Fairless Works of U.S. Steel the outstanding steel mill from the standpoint of air cleaning and ventilation.

This plant uses Westinghouse Industrial Heaters, Centrifugal Fans, Air Handling Units, and PRECIPITRON® Electronic Air Cleaners.

Choose the most complete line backed by undivided responsibility. Whether your requirements are for—

1. **Heating and Ventilating**
2. **Industrial Processes**
3. **Mechanical Draft**
4. **Cooling and Dehumidifying**
5. **Electronic Air Cleaning**

—put air to work with Westinghouse-Sturtevant apparatus.

MORE FACTS?

Call your nearest Westinghouse-Sturtevant Sales Engineer . . . he's the "Man with the Facts" on heating, air handling, and electronic air cleaning . . . or fill in the coupon below.

WESTINGHOUSE AIR HANDLING

YOU CAN BE SURE...IF IT'S

Westinghouse

J-80432

Westinghouse Electric Corp.
Sturtevant Division, Dept. 5D
Hyde Park, Boston 36, Mass.

Please send more facts on your Complete Line.

NAME AND TITLE..

COMPANY..

CITY...............................STATE.............

BENDS EASY!

CHASE® soft temper Copper Water Tube makes a neater, faster radiant heating job!

You can save time and *still* do a quality radiant heating job...with Chase Copper Water Tube. Its soft temper means it can be bent *by hand*. Its long 60 and 100 foot lengths mean you make fewer joints. Both of these features mean a faster, neater installation.

Lightweight Chase Copper Water Tube is easy to handle, easy to install. It can be joined quickly with leak-proof Chase Solder-Joint Fittings, using standard soldering techniques. Result—a radiant heating system that stays pressure-tight *for good!*

Chase Copper Water Tube and Chase Solder-Joint Fittings are available in all sizes from your Chase Wholesaler. Call him today.

Chase®

BRASS & COPPER CO.

WATERBURY 20, CONNECTICUT • SUBSIDIARY OF KENNECOTT COPPER CORPORATION

Chase Copper adds extra value to any home!

The Nation's Headquarters for Brass & Copper

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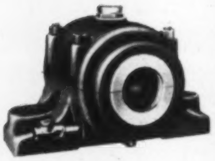
Waterbury
(†sales office only)

WHEREVER

IS REQUIRED

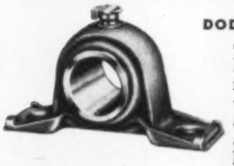
DODGE BEARINGS

FOR FAN AND BLOWER SERVICE

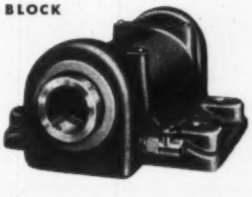


SLEEVOIL PILLOW BLOCK
A precision-built, ring-oiling babbitted bearing, self aligning and exceptionally quiet in operation.

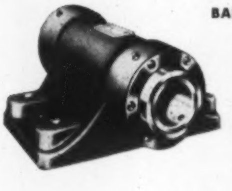
WATER-COOLED SLEEVOIL
Sleevoil Pillow Block, designed for industrial applications where high temperatures are encountered.



DODGE BRONZOIL
Capillary bronze bushing has capacity of one-third its volume in oil. Reservoir with close fitting wick around bushing provides ample lubrication. Both pillow blocks and flange units.



BRONZE BUSHED PILLOW BLOCK
Designed for arrangement No. 2 installations. Two bronze bushings of high lead content mounted in one cast iron housing. Special T-section rings for dependable lubrication.



BALL BEARING PILLOW BLOCK
For anti-friction installations. Two single row, deep groove ball bearings in one cast iron housing. Extended inner races carry the shaft.

CALL THE TRANSMISSIONEER
your local Dodge Distributor, for information about the entire Dodge line of bearings for fan and blower service. Look for his name in the Classified Telephone Directory under "Power Transmission Equipment." or write to the factory.

FOR INSTALLATIONS in hospitals, auditoriums, office buildings—wherever quiet operation is essential, Dodge offers the perfect answer to the bearing problem. Dodge manufactures a *complete line* of bearings for fan and blower service, all engineered and precision-built for exceptional quietness in operation.

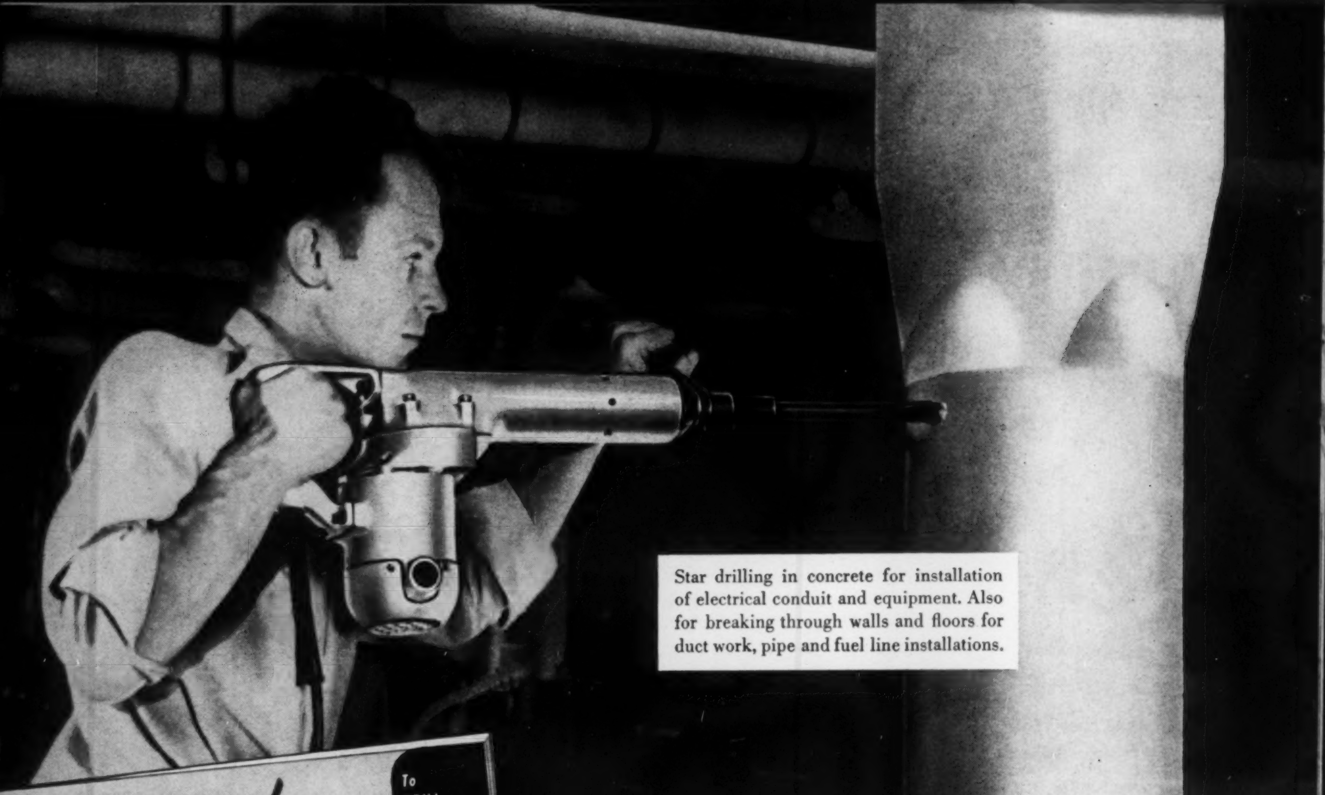
The Dodge line has been developed in close cooperation with the manufacturers of fan and blower equipment, to meet the specialized requirements in this field, efficiently and economically. For complete information on Dodge fan and blower bearings see your Dodge Distributor—or write the factory.

DODGE MANUFACTURING CORPORATION
1600 UNION STREET, MISHAWAKA, INDIANA

DODGE
of Mishawaka, Ind.

NAME PLATES

FOR YOUR NAME PLATE REQUIREMENTS, WRITE OUR SUBSIDIARY,
CHICAGO THRIFT-ETCHING CORPORATION, 1555 SHEFFIELD AVENUE, CHICAGO 22, ILLINOIS



Star drilling in concrete for installation of electrical conduit and equipment. Also for breaking through walls and floors for duct work, pipe and fuel line installations.

Black & Decker
ELECTRIC HAMMERS GIVE
MORE POWER TO YOU
to save time
... cut costs!

To
DRILL
DIG
PIERCE
BREAK

To
CHISEL
GOUGE
CHANNEL
NOTCH

To
CHIP
PEEL
POINT
CAULK

To
BATTER
SHAKE
SHATTER
SMASH

To do
HUNDREDS
of JOBS in
INDUSTRY
FASTER,
BETTER,
CHEAPER!

B&D A BLACK & DECKER HOW-TO-DO-IT BOOK

See where B&D Hammers save you time and money!

New Book shows how!

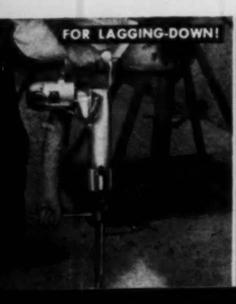
From drilling in concrete to holing-through walls, B&D Electric Hammers get more jobs done faster, better, cheaper! No other Hammer has so many features for comfort and safety. No other Hammer gives you so much working power in so little weight at such a low price! Get all the facts! Get this great B&D Hammer Handbook *FREE!* Page after page of on-the-job photos show how you can save time, cut costs on dozens of jobs in your own operation! Write to: The Black & Decker Mfg. Co., Dept. 2805, Towson 4, Maryland. Meanwhile, ask your B&D distributor for a demonstration!

CLASSIFIED TELEPHONE DIRECTORY | TELLS WHERE TO BUY IT

For nearest distributor, see "Tools-Electric."

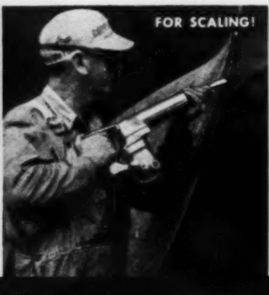
LEADING DISTRIBUTORS EVERYWHERE SELL

B&D **Black & Decker**
PORTABLE ELECTRIC TOOLS



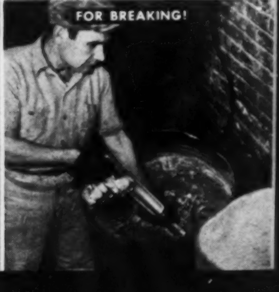
FOR LAGGING-DOWN!

FOR CHANNELING!



FOR SCALING!

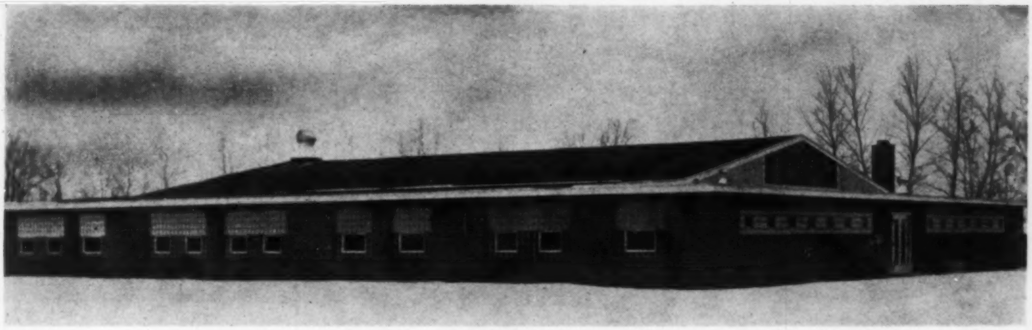
FOR SMASHING!



FOR BREAKING!

WARM AIR HEATED...

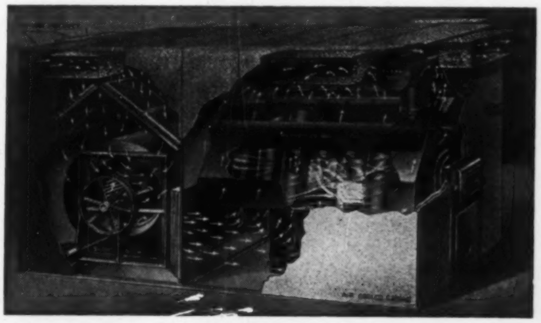
by Campbell



Public School, Bergen, North Dakota, heated with a No. 8100 Campbell stoker-fired unit. Installed 1954 by M & S Roofing & Sheet Metal Co., Minot, N. Dakota, H. M. Leonhard, architect, Bismarck, N. Dakota.

EXCEPTIONAL HEATING ECONOMY

Low first cost, low installation cost and low operating cost make warm air heating with Campbell units especially attractive for school heating. Campbell Heaters make full use of the natural advantages of warm air heating; fast heat delivery, positive control of temperature and ventilation; plus quiet operation and exceptional fuel economy. Campbell 8000 Heaters are available for all fuels in capacities up to 3,150,000 BTUs.



MANUFACTURERS' AGENTS

We have a number of attractive openings for manufacturers' agents who call on heating contractors and architects. If interested, please state territory you cover.

CAMPBELL HEATING CO.
Des Moines 17, Iowa

I am interested in your proposition for manufacturers' agents.

My territory covers ....

NAME ....

ADDRESS ....

CITY .... ZONE ...... STATE ......

CAMPBELL HEATING COMPANY

Des Moines 17, Iowa

NOW, easy installation, lifetime service with

BRIDGEPORT COPPER DRAINAGE TUBE

for soil, waste and vent lines
in residence and multi-story buildings

Bridgeport's new Copper Drainage Tube offers you these important advantages:

- *Space-saving, joint-saving 20-foot lengths*
- *Easy-to-handle lightness*
- *The speed and simplicity of solder connections*

In addition, installation costs are lower, yet service will be trouble-free for the life of the building.

You'll get prompt delivery of Bridgeport's Copper Drainage Tube from leading wholesalers throughout the country. Remember, too, it is precision made to the same high standards as Bridgeport's regular copper water tube and plumbing brass goods. Order your needs today.

BRIDGEPORT COPPER DRAINAGE TUBE

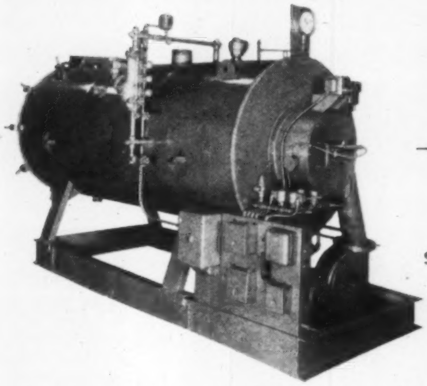
Standard Size Inches	Actual O.D. Inches	Wall Thickness Inches	Weight Lbs. per Ft.
1¼	1.375	.040	.650
1½	1.625	.042	.809
2	2.125	.042	1.07
3	3.125	.045	1.69
4	4.125	.058	2.87
5	5.125	.072	4.43
6	6.125	.083	6.10

Hard Temper — 20 ft. Straight Lengths

BRIDGEPORT BRASS
COMPANY ◆ BRIDGEPORT, CONNECTICUT

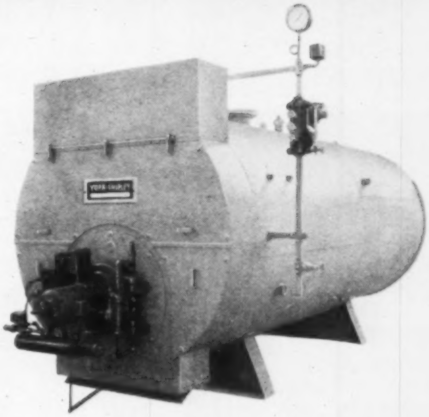
Sales Offices in Principal Cities—Conveniently Located Warehouses. In Canada: Noranda Copper and Brass Limited, Montreal, Quebec

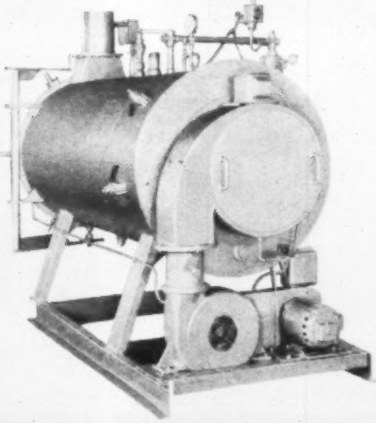
only YORK-POWER *has all 4*



STEAM-PAK Packaged
Steam Generators —
30 to 500 Horsepower
High or Low Pressure
Oil and/or Gas Fired

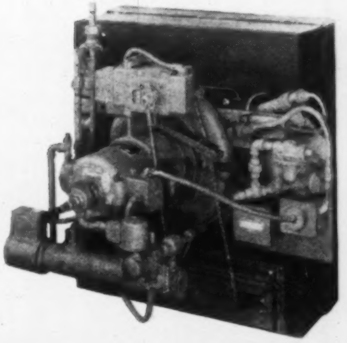
BOILER-BURNER Units
Scotch Marine (illustrated)
or Firebox Types
for Heating
Oil and/or Gas Fired





STEAM-PAKETTE
Packaged
Steam Generators —
15 to 30 Horsepower
High or Low Pressure
Oil and/or Gas Fired

F/C INDUSTRIAL Fuel
Burning Systems —
including Oil and/or Gas
Burners (45 to 400 Hp.),
Control Panels, Windboxes,
Fuel Oil Heaters, Accessories



for every steam generating or heating job specify YORK-POWER—1 of 4 will do the job

Get Complete Facts Today

Detailed Specifications Data on York-Power Equipment will be furnished on request. Dealership Openings Available in certain key markets.

INDUSTRIAL DIVISION
YORK-SHIPLEY, INC.
YORK, PENNSYLVANIA

Industrial Division,
YORK-SHIPLEY, INC., York, Pa.
Please send specifications on:

☐ Steam-Pak Generators; ☐ Steam-Pakette Generators;
☐ Boiler-Burner Units; ☐ F/C Fuel Burning Systems

Name ____________________
Address ____________________
City ____________ State ________

☐ We are interested in becoming a York-Power dealer. Please send additional details.

QUALITY CONTROLS

for Air Conditioning and Refrigeration

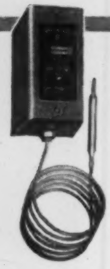
The Sign of
QUALITY
MOTOR CONTROL

Allen-Bradley motor controls are a sound investment. Many years of experience in the field have made them "tops"—because they are good for millions of trouble free operations. Their silver alloy contacts need no maintenance.

All Allen-Bradley control is so designed that it can be neglected in service. It is one of the *big reasons* why this control is so popular in air-conditioning and refrigeration installations.

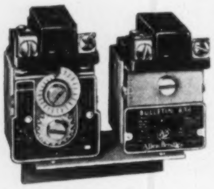
Specify Allen-Bradley . . . it stands for QUALITY.

Allen-Bradley Co., 1335 S. First St., Milwaukee 4, Wis.
In Canada—Allen-Bradley Canada Limited, Galt, Ont.

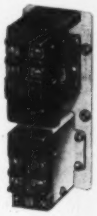

Bulletin 837 temperature control

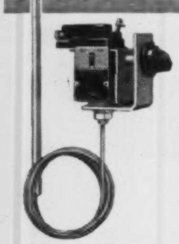
Bulletin 836 pressure switch

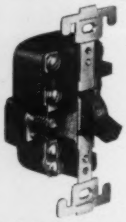
Bulletin 800 3-way selector switch


High and low pressure cutout

Watertight pressure switch

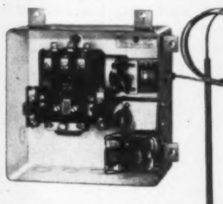

Bulletin 849 pneumatic timer

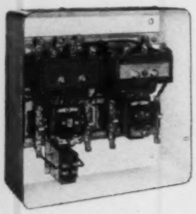

Bulletin 837 open temp. control

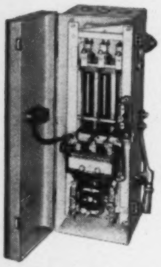

Bulletin 600 fractional hp starter

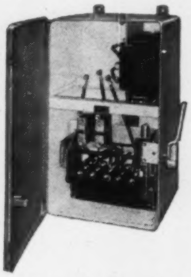
Bulletin 709 solenoid starter

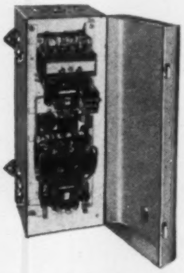
Bulletin 709 starter with selector

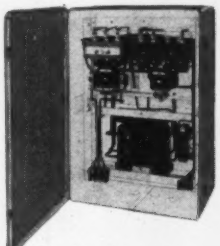

Special temperature control


Bulletin 736 automatic part-winding starter


Bulletin 640 manual stepless resistance starter


Bulletin 646 manual autotransformer starter


Bulletin 740 automatic resistance starter


Bulletin 746 automatic autotransformer starter

ALLEN-BRADLEY

SOLENOID MOTOR CONTROL

QUALITY

Profit Twice!

SELL YEAR-ROUND COMFORT WITH BURNHAM EQUIPMENT

WINTER COMFORT

Profit No. 1...

BURNHAM BASE-RAY*

RADIANT BASEBOARD

BASE-RAY, in a forced hot water system means winter comfort at its very best — the evenest, cleanest, most draft-free heating method known . . . the true radiant heat from BASE-RAY cast-iron units penetrates every corner . . . makes a home truly a cozy haven from winter's chill. Offer your customers this cold weather blessing . . . connected with an efficient, automatic, cast-iron Burnham Boiler . . . and you'll make Profit No. 1. BASE-RAY gives *quiet* comfort, too. There are no expansion noises and no "pings." Easy installation and absence of venting problems work in your favor. And with this Burnham lifetime equipment you can also provide plenty of domestic hot water the year 'round. It will make you friends as well as profits.

*Reg. U.S. Pat. Off.

SUMMER COMFORT

Profit No. 2...

BURNHAM HIDE-AWAY

CENTRAL COOLING EQUIPMENT

This new, modern HIDE-AWAY tucks away out of sight in closet, attic, cellar or utility room . . . a summer blessing for your customer that will make you Profit No. 2. HIDE-AWAY cools, dehumidifies, filters and circulates the air . . . four points that are musts for summer comfort. Operation is economical, too . . . HIDE-AWAY requires *no water* and will cool all or a few rooms as desired with a minimum of duct work. For instance in a one-story house *a central closet installation may serve all rooms* without ducts. HIDE-AWAY is a perfect unit for new or modernization jobs, so easily installed. »»»Sell this Burnham "Comfortizing" combination for *year 'round living comfort* . . . your customers will thank you for years to come . . . and you'll make a double profit to boot.

HIDE-AWAY is as easy to install as any heating system . . . no complicated engineering. Write for the Burnham Cooling Manual with its easy-to-follow installation instructions.

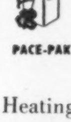
BURNHAM CORPORATION
Irvington, New York

BASE-RAY
Only 7" high, 2" deep. Inconspicuous. Improves all interiors.

Burnham

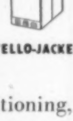
HIDE-AWAY
3 sizes — 1 ton, 1½ tons, 2 tons. Occupies only 6 sq. ft. of floor space.

A Burnham Boiler for Every Purpose



PACE-PAK ®

PACEMAKER ®



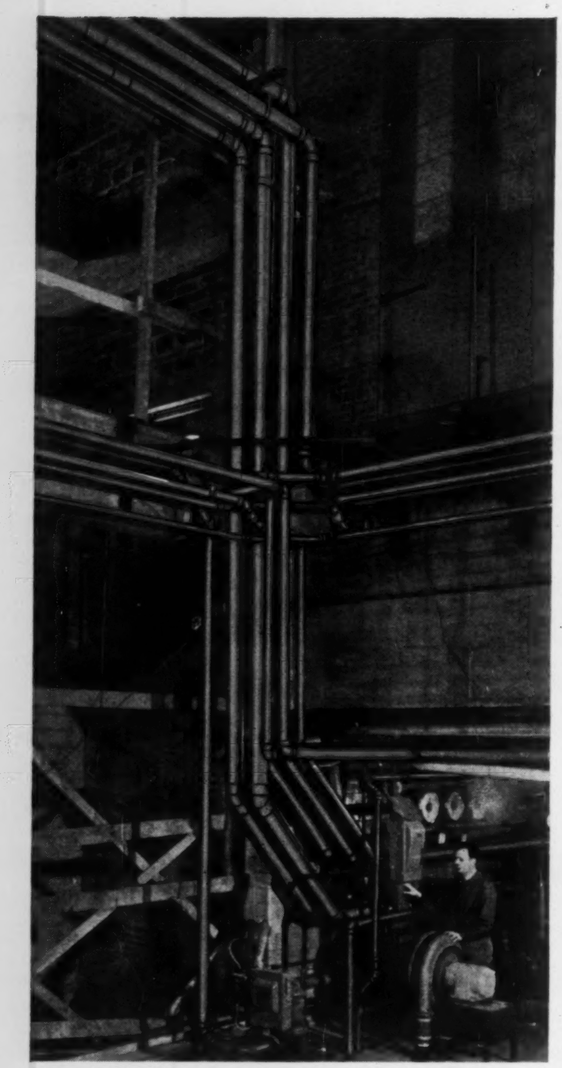
YELLO-JACKET

GAS BOILER

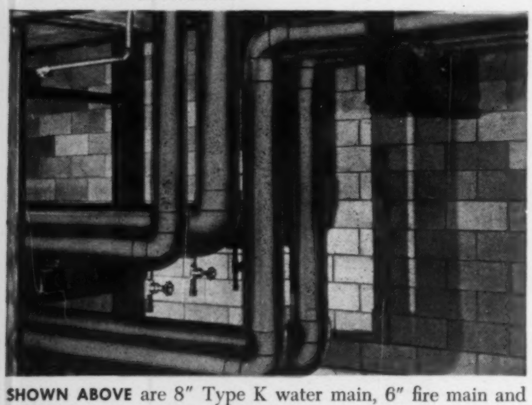
PACE-KING

Burnham Corporation
Irvington, New York HP-55

Please send booklets giving full information on
☐ BASE-RAY ☐ HIDE-AWAY Cooling Equipment
Name ....
Address ....
City........ .... State............



BOILER ROOM of new Ste. Justine Hospital, Montreal, Canada. Architect, Joseph Sawyer. Associate architect, Henri S. Labelle. Consulting engineers, Leblanc & Montpetit. Distributor, James Robertson Co., Ltd. All the above firms are located in Montreal, as is the Industrial Plumbing & Heating Co., Ltd. who made the installation.



SHOWN ABOVE are 8″ Type K water main, 6″ fire main and two 6″ hot water lines. Note tubes do not touch steel support. They rest on copper strip welded on U-shape support.

6″ and 8″ Water Mains of Anaconda Copper Tube installed in new hospital

Copper's non-rusting and corrosion-resistant properties assure long piping life, low maintenance costs

All hot and cold water lines in Montreal's new multi-million-dollar Ste. Justine Hospital are Type "K" Copper Tube. The installation includes 8″ tube for the main supply line and 6″ tube for the mains serving the hot water system and fire protection lines.

Industrial Plumbing and Heating Co., Ltd., Montreal, who made the installation, has this to say about copper:

"...proved most economical piping material because of complicated layout...made the installation in much less time than it would have taken with pipelines requiring threaded connections...longer lengths meant fewer fittings...solder-type fittings made quickly...easy to handle because of light weight...smaller sizes bent right on the job...able to make connections in close quarters where a threaded assembly would be impossible ..."

All these are good reasons why you can make big savings on installation costs when you use ANACONDA Copper Tubes.

Operating costs are less, too. The smooth, rust-free interior surface means lower pumping costs. The ease of dismantling and reassembling copper tube lines to meet changing piping requirements saves money and keeps costly shutdown time to a minimum.

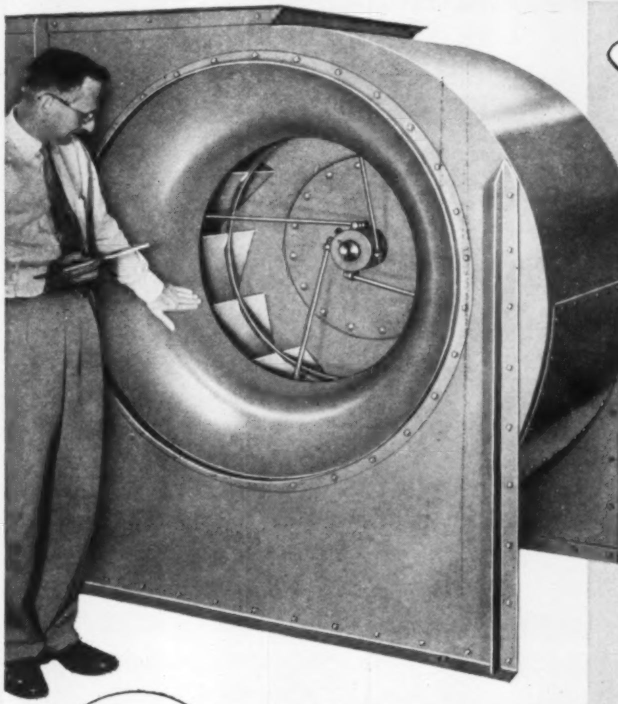
If our Technical Department can be of assistance in helping you solve a piping problem, don't hesitate to call on them. The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont. 5447

for copper piping call an

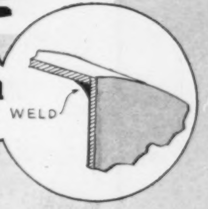
ANACONDA®

DISTRIBUTOR

7 KEYS *to smooth* FAN SYSTEM PERFORMANCE

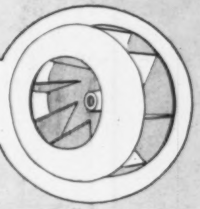


Rugged Construction



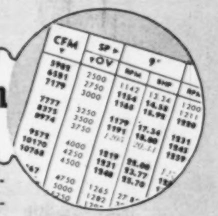
Ample gauges, strong bracing, parts predominantly welded. Housing seams welded to assure tightness.

Sound Design



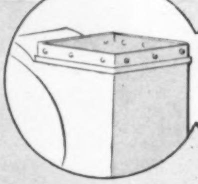
Over 60 years engineering experience—all types and applications.

Ease of Application



Complete Line—Standardized proportions—Test-proved ratings — selection simplified by quick-finding tables.

Simple Installation

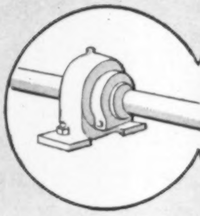


Reinforced outlets. Ready-to-use connections—smooth finishes, inside and out.

Operating Economy

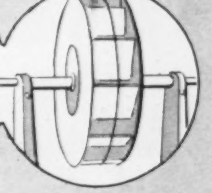
Streamlined air passages—closely fitted running parts — accurate contours.

Low Maintenance



Finest bearings, shafts, fastenings, and other components.

Long Life



Precision dynamic balancing, thorough inspection of parts and assemblies.

PLUS — the complete plant facilities and personnel to deliver the equipment to your order

Bayley BLOWER COMPANY

6600 W. Burnham Street • Milwaukee 14, Wisconsin

BRUNER
WATER SOFTENERS & FILTERS

for Industrial Installations

Hundreds of Bruner Industrial Water Softener installations are proving their superiority in military bases, industrial plants, hotels, hospitals, schools and colleges in all parts of the United States, Canada, Alaska and South America.

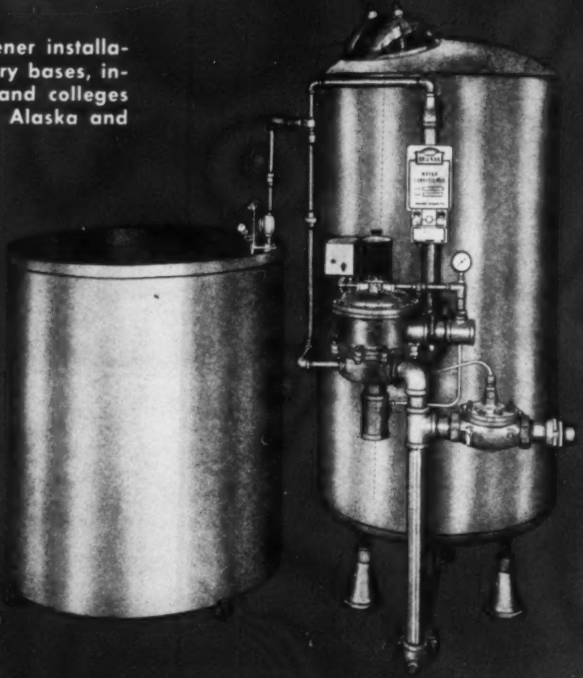
Examples of Bruner Industrial Installations:

SCHOOLS AND COLLEGES
University of Wisconsin — Madison, Wis.
University of Missouri — Columbia, Mo.
Peabody High School — Trenton, Tenn.

HOTELS AND HOSPITALS
Jung Hotel — New Orleans, La.
Gulf Bay Hotel — Sarasota, Fla.
Athens State Hospital — Athens, O.

INDUSTRIAL
Chevrolet Division GM — Flint, Mich.
Halle Bros. Dept. Store — Canton, O.
Havana Laundry — Havana, Cuba
General Electric Co. — Bloomington, Ind.

MILITARY
Wright Patterson Air Force Base — Dayton, O.
Big Spring Air Force Base — Big Spring, Tex.



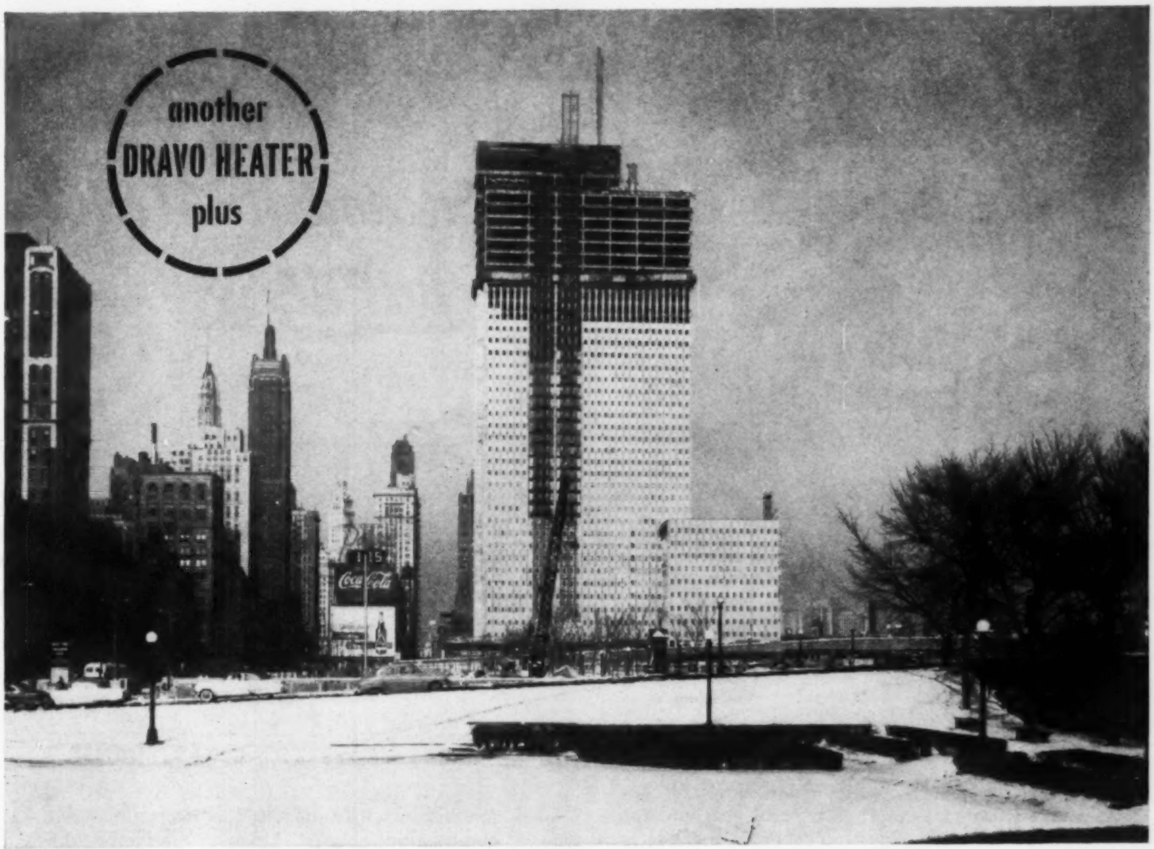
There are Bruner Sales and Engineering offices in principal cities. Your inquiry will receive immediate attention.

Manual and Fully Automatic softeners in capacities up to 1,500,000 grains are carried in stock. Larger capacities and special equipment to treat unusual water conditions engineered to meet your requirements.

BRUNER
WATER SOFTENERS & FILTERS

BRUNER Corporation
4763 N. 32nd Street • Milwaukee 16, Wisconsin

Sales Offices in Principal Cities • Plants in Milwaukee and Santa Barbara



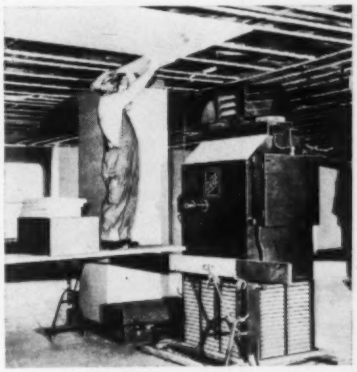
Heaters put Chicago's new skyscraper ahead of schedule!

Maintaining tight building schedules on the new 41-story Prudential Mid-America Building during rugged Chicago wintertime weather called for more than conventional construction heating devices.

George A. Fuller Company, general contractors, selected sixteen Dravo "Counterflo" Heaters and used two on each floor. Since "Counterflo" Heaters are a complete self-contained heating package, it was a simple matter to place the units in service by merely utilizing a portable fuel tank and "plugging in" to a 220-volt outlet. With this type of operation it was easy to rotate heaters from floor to floor as building activity progressed.

Despite temperatures as low as 15 degrees below, and icy winds up to 50 miles per hour, each Dravo Heater blanketed an area of more than 40,000 square feet with warm air. Workmen handled their job in comfort, unimpeded by the need for heavy clothing. Results? Minimum time off for colds and cold weather ailments, ahead of schedule on construction, earlier-than-planned occupancy. These heaters provided further benefits in that drying of plaster, cement and paint was also accelerated.

This rather unique application points out another of the many benefits that make Dravo Heaters your best heating investment today. Now, in addition to quality construction and top operating efficiency, Dravo "Counterflo" Heaters carry a fully bonded guarantee on all vital parts for 10 years! Such features make Dravo Heaters today's best *and most economical* heating buy! You can get complete details today by using the coupon below.



Dravo Corporation, Department A-1405
Fifth & Liberty Avenues
Pittsburgh 22, Pa.

I am interested in Dravo Heaters for __________ btu per hour

☐ Please send literature

☐ Please have a representative call

Name ____________________

Company ____________________

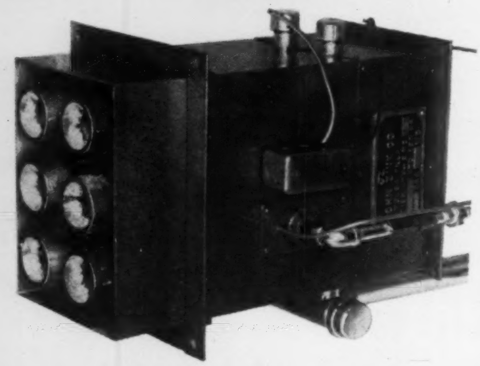
Address ____________________

City __________ Zone _____ State _____

DRAVO
CORPORATION
Pittsburgh 22, Pennsylvania
Representatives in all principal cities

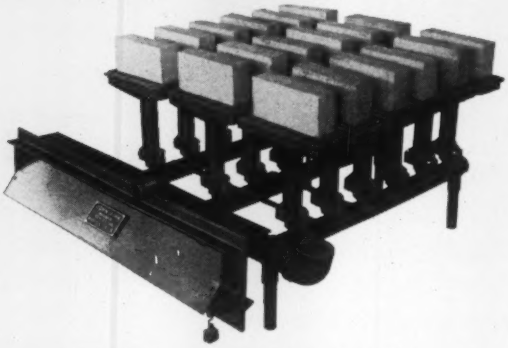
JOHN ZINK

POWER and HEATING BURNERS



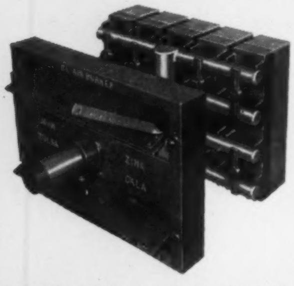
SERIES STV GAS BURNER

Ideal for heating boiler installations, to convert from coal or oil to natural gas; and for firing Scotch Marine boilers. From one to fifty heads. Supplied as a complete packaged unit. Quiet, efficient and economical to operate.



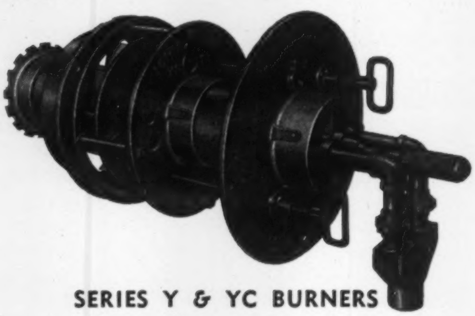
SERIES VR VERTICAL GAS BURNER

The VR Burners are especially designed to operate in boilers having low draft and small combustion space. "Upshot" radiant type with multiple burner heads. Capacities from 4" to 4 oz.



SERIES "R" BI-AIR BURNER

For all types and sizes Heating Boilers and small Power Boilers. Short flame gas burner with multi-jet burners. Has refractory semi-venturi mixing throats. Capacities to meet your requirements — 4" to 1#.



SERIES Y & YC BURNERS

Combination gas and oil burners designed for boilers and furnaces where maximum heat release at low excess air and high heat density place a premium on reliable burner performance. Has extremely high turn-down ratio. Low first cost.

Write for illustrated bulletin on John Zink equipment.

All John Zink Burners are protected by U. S. Letters of Patent

JOHN ZINK COMPANY

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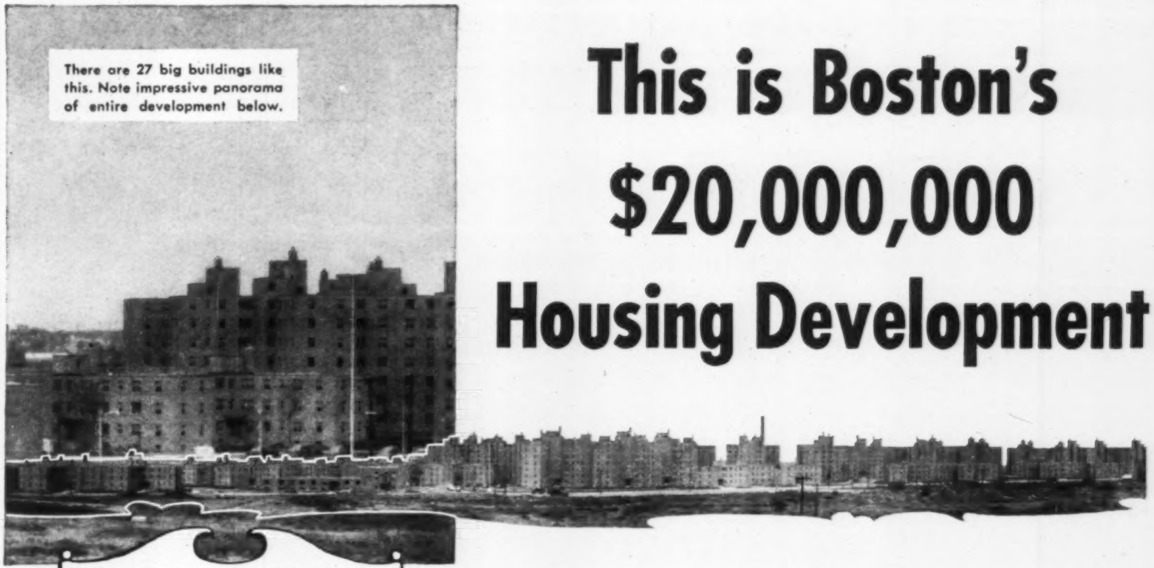
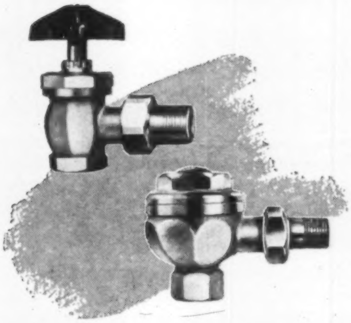

There are 27 big buildings like this. Note impressive panorama of entire development below.

This is Boston's $20,000,000 Housing Development

Architect
M. A. Dyer, Boston
Engineer
J. A. McCusker Co., Boston
Heating Contractor
M. J. Flaherty Co., Boston

Largest in New England—Third Largest in the World—

Marsh Valves and Traps all the way


America's finest packless radiator valve and the radiator trap to go with it. Sizes and patterns for all requirements.

A city in itself! Fifteen seven-story buildings. Twelve three-story buildings. Housing for 1504 families. Fifteen acres of play area for the youngsters. That is a bird's-eye glance at the vast, $20,000,000 Columbia Point Housing Development in Boston.

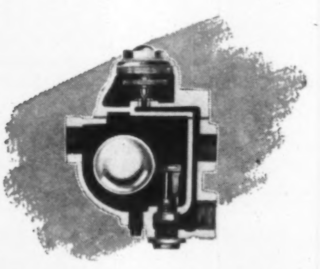
It takes a lot of heat to keep the 9000 rooms of these 27 big buildings comfortable in New England winters . . . in fact it takes the largest low-pressure heating plant ever built in New England!

This job was too big to take chances. So Marsh Valves and Traps were installed throughout the giant distribution system. It is the familiar story of *Marsh throughout* for the big jobs where top importance is placed on efficiency and dependability.

And remember this: no job is *small* enough to gamble on. For your next installation, large or small, use the valves, traps, and vents that have earned the confidence of the most critical heating engineers and contractors.

Ask for Catalog 76-H covering the full line of Marsh Heating Specialties

MARSH HEATING EQUIPMENT CO. *Sales affiliate of Jas. P. Marsh Corporation*
Dept. T, Skokie, Ill. Marsh Instrument & Valve Co. (Canada) Ltd., 8407 103rd St., Edmonton, Alberta

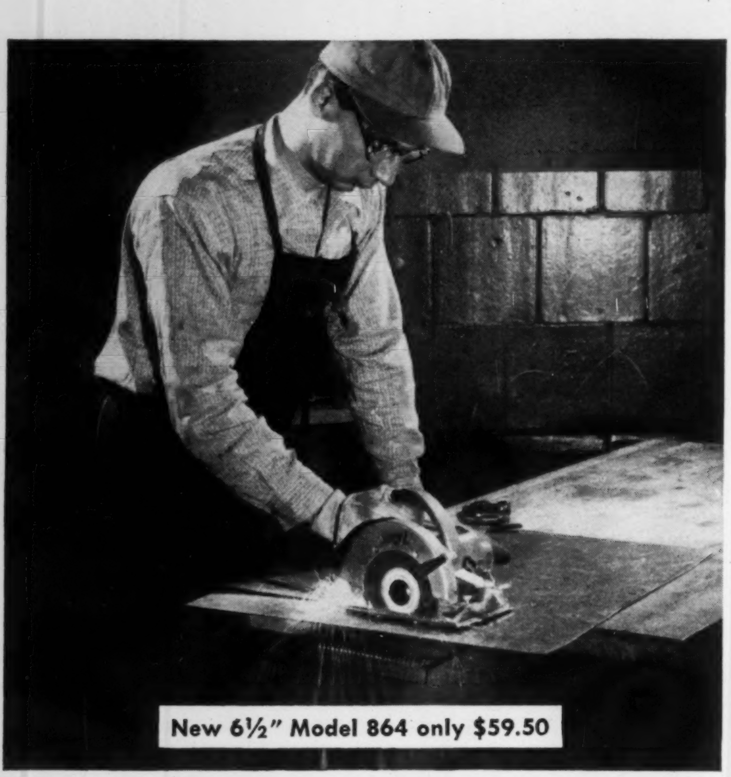

Dependable is the word for the broad line of Marsh Float and Thermostatic Traps. Sizes and types for all heating services.

MARSH

Quality Heating Specialties **SINCE 1865**

at the lowest prices in history

NO SHOP CAN AFFORD TO BE WITHOUT ONE OF THESE 3 RUGGED NEW SKIL SAWS



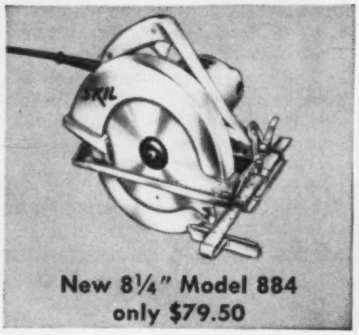
New 6½" Model 864 only $59.50

New heavy duty SKIL Saws offer a light weight compact answer to every cutting problem in the shop or on the job.

You'll find one of these SKIL Saws ideal to help you on every one of your heating, air conditioning or sheet metal jobs. This is a real heavy-duty construction tool, yet it's priced so low that it'll pay for itself in no time. Light weight, compact, powerful . . . use it to cut floor openings, duct entries, all materials including sheet metal, plaster, composition and even concrete.

3 sizes—6½", 7¼", 8¼"—give you the right capacity for every job. New low prices give you big savings. And, all the famous SKIL features assure more profitable operation for you.

New 7¼" Model 874 only $69.50



New 8¼" Model 884 only $79.50

Exclusive SKIL features for better performance

- **Extreme light weight and the famous SKIL balanced design for easy handling.**
- **Easy, fast cutting in any position.**
- **High speed blade.**
- **Rugged, heavy-duty motor.**
- **Strong die-cast aluminum motor housing.**
- **Ball and needle roller bearings throughout.**
- **Quick-acting depth & bevel adjustment.**
- **Calibrated rip fence for both right and left hand cuts.**
- **Safety guard retracting handle for pocket cuts.**

BRIEF SPECIFICATIONS

Model No.	864	874	884
Blade Diameter	6½"	7¼"	8¼"
Maximum Depth of Cut	2³⁄₁₆"	2⅜"	2⅞"
Depth Cut at 45°	1¾"	1⅞"	2⅛"
No-Load Speed	6100 r.p.m.	6000 r.p.m.	5700 r.p.m.
Net Weight	11 lbs.	13½ lbs.	14¾ lbs.

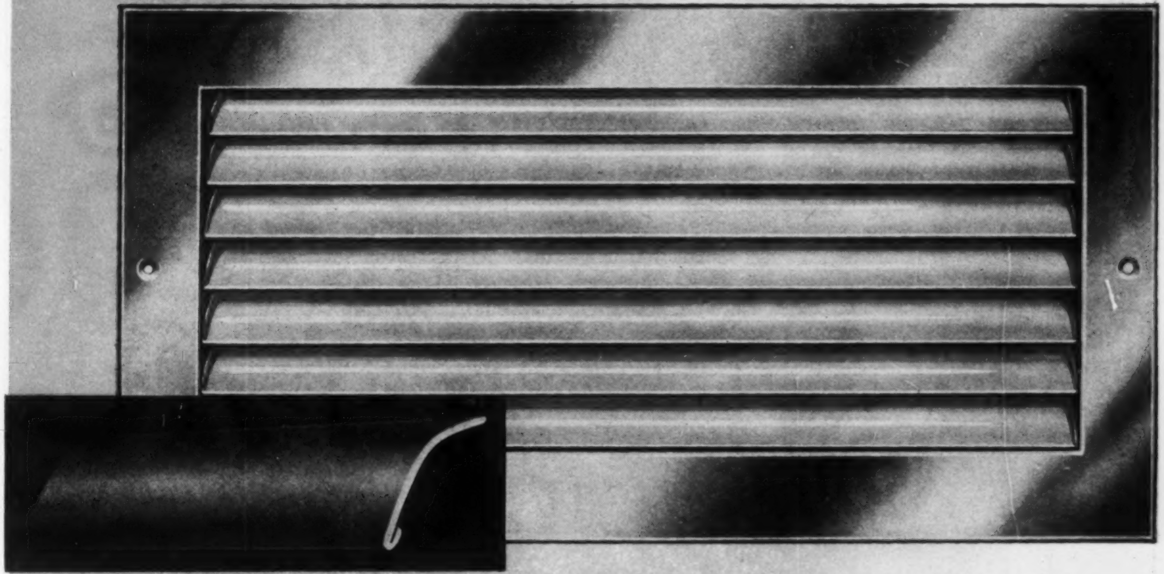
SKIL
PORTABLE TOOLS

Made only by SKIL Corporation
formerly SKILSAW Inc.
5033 Elston Avenue, Chicago 30, Illinois
3601 Dundas Street West, Toronto 9, Ontario
Factory Branches in All Leading Cities

Call your SKIL distributor for a Free on-the-job demonstration and a Free Trial

NEW IMPROVED

Return Air Grille



CURVED HEMMED FINS GIVE 80% FREE AREA

designed by TITUS

Large free area means the Titus Return Air Grilles HANDLE MORE AIR PER SQUARE INCH. Makes it possible for a smaller grille to give superior performance . . . at lowest cost . . . and correct performance faults of other parts of an air conditioning or heating system . . . at the same time.

NEW BEAUTY
Matches design of supply grilles. Curved outline of fins add beauty . . . at the same time make it easy for maintenance personnel to keep grilles clean.

ONE-PIECE ASSEMBLY . . . FOR ANY SIZE OPENING
This eliminates expensive labor of handling old-fashioned grilles that are made in sections. Cuts costs of fitting, butting and screwing together these sections. Brings labor and grille costs to a minimum.

MORE STRENGTH PER SQUARE INCH
The curved hemmed fin design adds rigidity and durability to resist lower wall abuse. There is no see-thru due to the special positioning of the fins.

WRITE FOR FREE CATALOG TODAY

Return Air Grille
TITUS

TITUS MANUFACTURING CORP.
WAITERLOO, IOWA

Gentlemen: I wish to *improve the heating and air conditioning performance of my forced air systems* . . . at the same time lower my grille costs. Please send me the new illustrated brochure on Titus Return Air Grilles.

Name ______________________

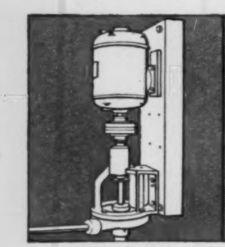
Company ______________________

Address ______________________

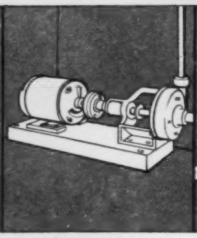
City ______________ State ______________

ALLIS-CHALMERS
Air Conditioning
PUMPS

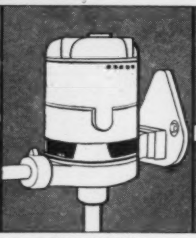
One Pump ...6 Mounting Methods



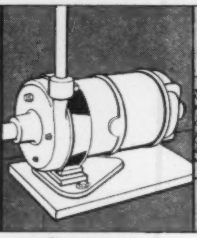
Base mounted, vertical



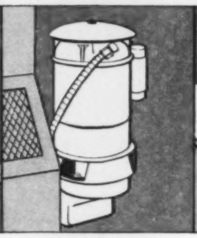
Base mounted, horizontal



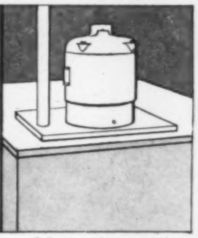
Close-coupled, vertically mounted



Close-coupled, horizontally mounted



Tank wall mounted



Submerged mounted

makes easier installation for you

YOU CAN SOLVE MANY DIFFICULT INSTALLATION problems by using Allis-Chalmers air conditioning pumps. You can get a single set of operating characteristics using four different models that can be installed in any of six different ways. You can choose the mounting method easiest for your job without having to figure a different pump each time.

Engineering Assistance

Your Allis-Chalmers representative or distributor is an experienced, highly qualified specialist who will give you full cooperation every step of the way. He'll help you pre-engineer the setup. Many times he can make valuable suggestions which will result in a simpler, more effective installation.

Delivery from Convenient Stock

Allis-Chalmers air conditioning pumps in a wide range of types and sizes are carried in stock by Regional Warehouses and Authorized Distributors throughout the country. A-4577

Electrifugal is an Allis-Chalmers trademark.

ALLIS-CHALMERS
PACKAGE PUMPS for AIR CONDITIONING

For literature on Allis-Chalmers
FHP Package Pumps get Bulletin 52B7529 . . .
Electrifugal Pumps, Bulletin 52B6140 . . .
Supporting Adaptor Pumps, Bulletin 52B6083
. . . Vertical Mounted Pumps, Bulletin 52B6975.
Write Allis-Chalmers, Milwaukee 1, Wisconsin.

A-C
ALLIS-CHALMERS

ALLIS-CHALMERS

How to Select an Economical Temperature Regulator

First of all, what does *economy* mean where temperature regulators are concerned? In some industries it means improvement of product or reduction of spoilage through closer control of process temperatures. In others, it means the paring down of operating expense. The price of the regulator itself is a relatively small factor.

Today's buyers are shopping for:

1. Accuracy of control — not only when the regulator is new, but throughout its service life
2. Dependability — to prevent loss of production time
3. Minimum installation and maintenance cost

Here are a few tips on what to look for when you're installing a new or replacing an old temperature regulator —

Packless construction . . . and for this reason: A diaphragm operated, packless regulator minimizes friction. There are no closely fitted parts to stick or bind because of uneven expansion or collection of foreign matter. Also, there's less maintenance, since no repacking is ever required.

A guarantee against wire drawing of the seats and discs. Insist on it. This guarantee in combination with single seat design assures you of tight shutoff; you avoid expensive steam losses as well as loss of product in a process application.

Broad control range. In a standard regulator you should expect a control range of 100 F. And make sure the unit you select has a vapor tension thermostat that can take over-temperatures of at least 100 F.

Easy maintenance. Why ask for grief? Your temperature regulator should be basically simple in design so that it can be serviced by average plant personnel. All parts should be readily accessible for testing and cleaning.

Double duty. There's no point in buying a separate pressure regulator when you can select a temperature regulator that combines both temperature and pressure control within the same unit.

Self-operating. Make sure you get a regulator that operates on its own initial pressure. By doing so, you avoid the purchasing and maintenance of an air compressor plus air piping, and you're sure of uninterrupted operation during electric power failures.

• • • •

All of these points are important to you when it comes to selecting an economical temperature regulator. Perhaps you didn't realize you *could* expect so much. And perhaps you didn't realize that Spence Temperature Regulators offer all these features and more. May we send you our Bulletin T500 containing further details?

SE 138

SPENCE ENGINEERING COMPANY, INC.
Walden, New York

JENKINS PRACTICAL PIPING LAYOUTS 75

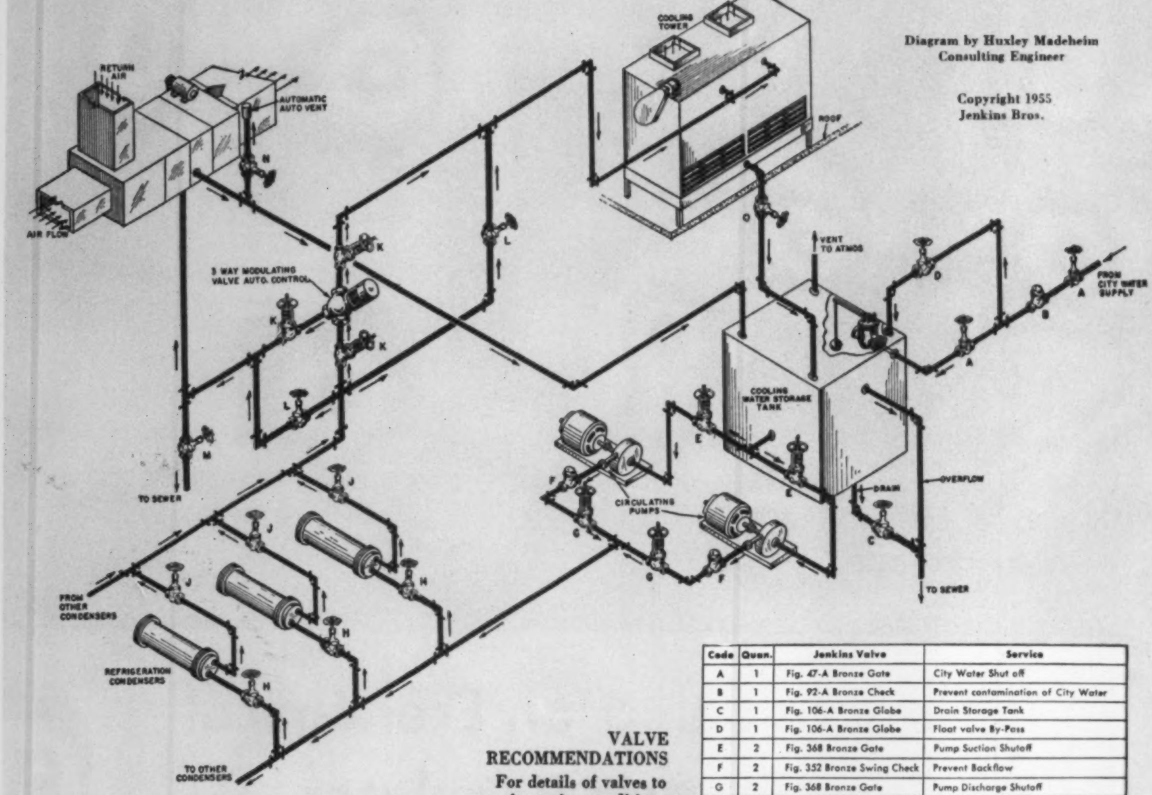


Diagram by Huxley Madeheim
Consulting Engineer

Copyright 1955
Jenkins Bros.

VALVE RECOMMENDATIONS
For details of valves to suit varying conditions see Jenkins Catalog.

Code	Quan.	Jenkins Valve	Service
A	1	Fig. 47-A Bronze Gate	City Water Shut off
B	1	Fig. 92-A Bronze Check	Prevent contamination of City Water
C	1	Fig. 106-A Bronze Globe	Drain Storage Tank
D	1	Fig. 106-A Bronze Globe	Float valve By-Pass
E	2	Fig. 368 Bronze Gate	Pump Suction Shutoff
F	2	Fig. 352 Bronze Swing Check	Prevent Backflow
G	2	Fig. 368 Bronze Gate	Pump Discharge Shutoff
H	3	Fig. 106-A Bronze Globe	Condenser Water Control
J	3	Fig. 370 Bronze Gate	Condenser Water Shutoff
K	3	Fig. 368 Bronze Gate	Modulating Valve Shutoff
L	2	Fig. 106-A Bronze Globe	Modulating Valve Bypass
M	1	Fig. 106-A Bronze Globe	Drain Heating Coil
N	1	Fig. 106-A Bronze Globe	Vent Control
O	1	Fig. 106-A Bronze Globe	Cooling Tower Water Discharge Shutoff

How to plan piping connections for

SPACE HEATING WITH HOT WATER DISCHARGE FROM REFRIGERATION CONDENSERS

Where continuous refrigeration is required, the heat absorbed by the water circulating through the condensers during the refrigeration cycle may be transferred to circulating air and used for space heating. This hookup illustrates a system that is widely approved for utilizing waste heat in frozen food plants, ice cream plants, supermarkets, and refrigerated warehouses.

A cooling tower for water conservation is included in the usual water cooling system for refrigeration condensers, as indicated. All or a portion of the water which usually flows through the cooling tower system may be diverted and circulated instead through a water coil in the summer air conditioning unit. A three way modulating valve, actuated by a room thermostat, controls the water passing through the two parallel circuits, dividing it according to the heating requirements.

Excess heat, when all the heat is not required, is removed by regulating the amount of the water circulated through the parallel path of the cooling tower. Additional heat may be provided, when needed, from any other customary source.

The cooling tower circuit provides for water storage in a tank inside the building to avoid freeze-ups. The water circuits shown can be full weight red brass pipe, copper tubing, or black iron pipe.

This combination of refrigeration and heating is an adaption of the heat pump cycle and will provide both refrigeration and heat for minimum operating costs.

Consultation with accredited piping engineers and contractors is recommended when planning any major piping installation.

To save time, to simplify planning, to get all the advantages of Jenkins specialized valve engineering experience, select all the valves you need from the complete Jenkins line. It's your best assurance of *lowest cost in the long run.* Jenkins Bros., 100 Park Ave., New York 17.

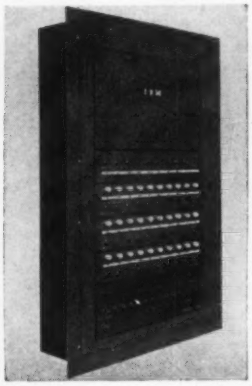
COMPLETE DESCRIPTION AND ENLARGED DIAGRAM OF THIS LAYOUT FREE ON REQUEST. Includes additional detailed information. Ask for Piping Layout No. 75.

JENKINS
LOOK FOR THE JENKINS DIAMOND
VALVES
SINCE 1864
TRADE JENKINS MARK

SOLD THROUGH PLUMBING-HEATING AND INDUSTRIAL DISTRIBUTORS

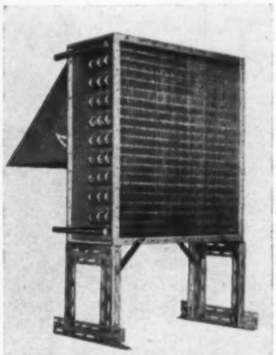
EQUIPMENT DEVELOPMENTS . . .

For reviews of Recent Trade Literature see Page 271



Control System . . .

. . . follows preset programs, automatically switches on or off to 40 groups of remote operations, each on its own time schedule—International Business Machines Corp., 590 Madison Ave., New York 22. Central operations panel sends command pulses for heating, ventilating, lighting, valve operating, motor starting, etc. System uses carrier current signals, operates over existing electrical circuits.

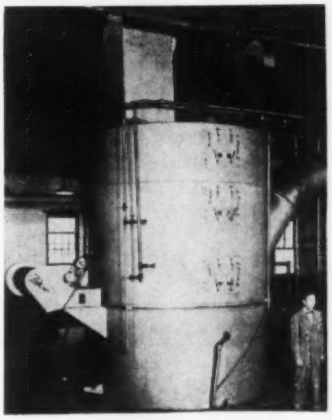


Air Cooled Condenser . . .

. . . units feature "no water" construction for indoor and outdoor installation—Peerless of America, Inc., 5830 N. Pulaski Rd., Chicago 30. Sizes to 10 tons, stands for multiple units to 40 tons. Eliminates problems common to wet systems, says company.

Thermostatic Selector . . .

. . . valve for year 'round air conditioning—Detroit Controls Corp., 5900 Trumbull Ave., Detroit 8. "Selectaflow" control uses hot or cold water as heat exchange medium, Summer to winter, winter to summer changeover done thermostatically from temperature of incoming water. Adjustment knob, once set, provides constant temperature winter and summer, says company.

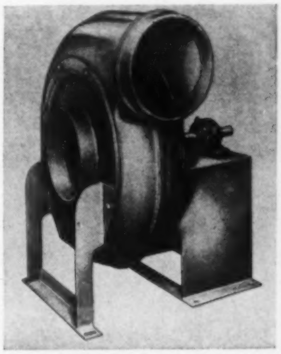


Dust Collector . . .

. . . uses wet collection principle—National Engineering Co., 549 W. Washington Blvd., Chicago 6. Dust laden air drawn up through filter bed of glass spheres flooded with water. Air flow is broken into individual streams which follow continuous course upward between spheres, through water. Turbulent layer of water and air above filter bed is said to insure contact and entrapment of dust particles by moisture droplets. Capacity range: 500 to 35,000 cfm.

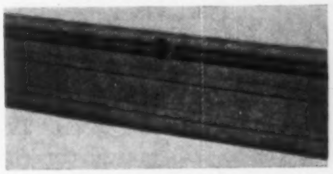
Natural Gas Powered . . .

. . . reciprocating air conditioning system—Cobell Industries, Inc., P.O. Box 1157, Ft. Worth. Designed for commercial, residential systems from 2 to 10 tons. Said to operate with larger systems as well. Operates with standard compressors. Functions at full rated capacity using 1 brake hp of gas engine to 1 ton refrigeration under summer conditions of 95 F dry bulb, 75 F wet bulb. Device is for use with "Aqua-Fog" evaporative condenser.



Industrial Fans . . .

. . . for rugged industrial uses—Sturtevant Div., Westinghouse Electric Corp., 200 Readville St., Hyde Park, Boston 36. For handling wood shavings, chips, granular material, textile fibers, asbestos, rags, powders, dust, gases, etc. Four wheels, three drive arrangements for specific applications. Size ranges: wheel diameters, 8¼ to 34½ in.; inlet pipe sizes, 4½ to 18 in.; air volumes, to 12,000 cfm.



Baseboard Diffuser . . .

. . . for warm air heating—Vulcan Radiator Co., 775 Capitol Ave., Hartford 6, Conn. Designed to distribute warm air from single duct outlet over extended wall areas same as conventional baseboard radiation. In 2, 4, 6, 8, 10 ft lengths.

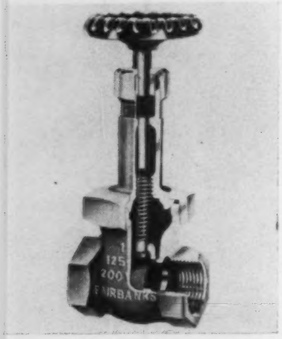
Electrical Insulation . . .

. . . of all silicone rubber for large motors and generators—Allis-Chalmers Mfg. Co., Milwaukee 1. "Silco-Flex" available for all class H insulated form wound coils, class A and B windings operating under certain service conditions. Is said to operate under extreme moisture conditions. Other cited advantages of material: heat and abrasion resistance, flexibility, chemical inertness, improved heat dissipation.

EQUIPMENT DEVELOPMENTS
Continued

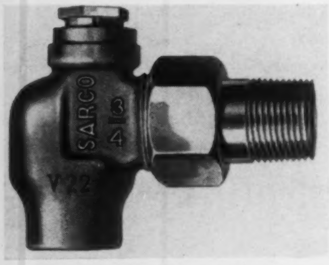
Temperature Control . . .

. . . provides two stage operation from single actuating bourdon tube—Mercoid Corp., 4201 W. Belmont Ave., Chicago 41. Has two adjustable magnetic mercury switches for successive stage operation or high-low operation. In 11 operating ranges.



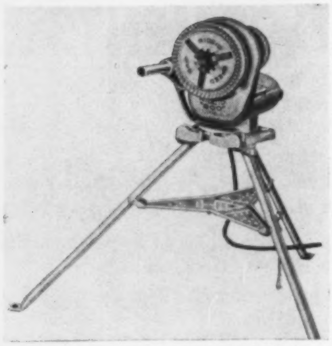
Gate Valves . . .

. . . have new union bonnet, rising stem to replace solid and split wedge rising stem screwed bonnet valves in 125 and 150 lb steam pressure classes —Fairbanks Co., 393 Lafayette St., New York 3. Radial seat of bonnet is machined true ball and socket joint for tight body bonnet connection, alignment of working parts. Two piece construction said to eliminate sliding or scraping of mating body and bonnet.



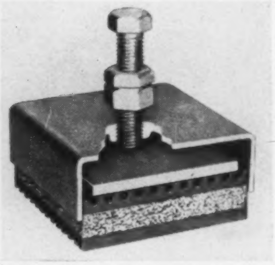
Balancing Fitting . . .

. . . for hot water, radiant systems—Sarcotherm Controls, Inc., Empire State Bldg., New York 1. Uses segment of circle instead of butterfly restriction. Is said to assure equal flow with equal opening. Suitable for 200 psi water pressure. Also available with integral manual air vent.



Power Drive . . .

. . . for operation of hand pipe tools has folding tripod, integral tray—Ridge Tool Co., Elyria, Ohio. Equipped with "Speed Chuck," said to grip pipe, conduit, rod tightly forward or reverse. Capacity: 1/8 to 2 in. pipe or conduit.



Leveling Mount . . .

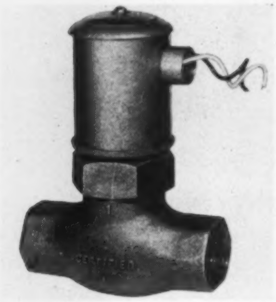
. . . serves as vibration absorber—Korfund Co., Inc., 48-01F 32nd Pl., Long Island City 1, N. Y. Damper requires no anchor bolts and shims. "Lev-Elasto" is said not to "walk." Can be picked up with machine, used over and over, says company.

Multiple Branch Tee . . .

. . . with integral extruded outlets—Tube Turns, 224 E. Broadway, Louisville 1. Designed as solution to header problems in petroleum, chemical, power fields. Also for use in air conditioning, radiant heating systems.

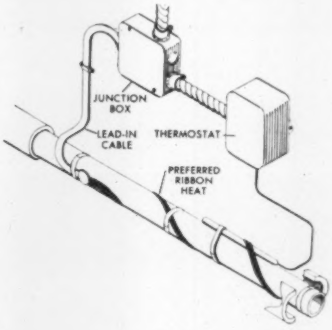
Rotary Type Pumps . . .

. . . for severe corrosive and abrasive service—Vanton Pump & Equipment Corp., Hillside, N.J. Combines basic self priming, no stuffing box, no shaft seal features of company's "Flex-i-liner" pump with design to protect bearings from fumes, chemical attack. Capacities: fractional to 5 gpm, 0 to 50 psi discharge pressures.



Solenoid Valves . . .

. . . featuring stainless steel construction of parts contacting media—J. D. Gould Co., 730 E. Washington St., Indianapolis 2. "Velvetrol" cushioned closing designed to eliminate shock, prolong life. Piston pilot operated. Includes "Teflon" renewable discs, "Guidon" pilot valve seats to aid tight seating. Sizes: 1/2, 3/4, 1 in.



Oil Line Heater . . .

. . . of flexible tube for electric heating of suction lines—Preferred Utilities Mfg. Corp., 1860 Broadway, New York 23. Purpose is to keep oil in lines at pumpable temperature. Tape is 1/2 in. wide, 1/10 in. thick. Of braided, insulated fusible alloy resistance wires. Maintains lines at 100 or 120 F.

A FIRE Started in this School....

Its Path was Barred by Multiple Accordion Aluminum!

This is the New Bridge Elementary School in New Milford, N. J. When it was built, Arthur Rigolo, the architect, had specified Infra multiple accordion aluminum insulation, Type 6, and it was installed in the ceilings.

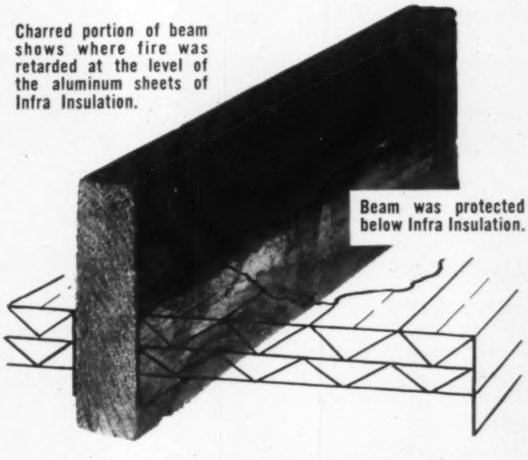
In July 1953, the roof of this school was set on fire from the outside. Most of the roof area ABOVE four classrooms was destroyed, but Infra Insulation protected their ceilings. The fire did not penetrate below the insulation.

The *ceiling beams* were found to have been charred by the fire ABOVE the insulation; but the SAME *ceiling beams* were NOT charred below it.

When the roof area was renovated in August 1953, Infra multiple accordion aluminum insulation was *again* installed between the roof beams.

Fires sometimes spread more rapidly when aggravated by Heat-Rays or Radiation; or because of flow of super-heated air. The surfaces of multiple accordion aluminum have a Heat Ray or Radiation absorptivity and emissivity of only 3%, with 97% reflectivity, whether the heat rays originate in the sun, a furnace, a warmed surface or a burning area in a building. Aluminum will not burn. It has a melting point of 1220° F. Even the fiber separators of standard Infra are flame-resistant.

Charred portion of beam shows where fire was retarded at the level of the aluminum sheets of Infra Insulation.



Beam was protected below Infra Insulation.

Photograph of section of ceiling beam removed from New Bridge School when fire damage was repaired.

To obtain maximum, uniform-depth protection against heat loss and condensation formation, it is necessary to use the new edge-to-edge multiple aluminum,* each sheet of which stretches from joist to joist, and also all through the flanges for further vapor protection as well as permanent attachment of each sheet of aluminum.

In addition to reflecting heat by Radiation, which represents 50% to 93% of all heat transferred through building spaces depending on direction of heat-flow, the layers of aluminum and fiber retard convection, or movement of warm air. The alternating air spaces have low density, therefore Conduction through them is slight. The solid aluminum sheets, long and continuous, are almost completely impervious to water vapor. Infiltration under the flat, stapled flanges is slight.

Condensation on or within this type of insulation is minimized by the scientific construction of multiple layers of aluminum, fiber and air spaces.

A very useful and interesting "Radiation Table" listing the Emissivity, Absorptivity and Reflectivity of the Surfaces of a long list of materials has been prepared by Alexander Schwartz, president of Infra Insulation, Inc. It is yours for the asking.

Also yours for the asking is an illuminating discussion of why and how aluminum insulates, even under extreme conditions. It will be found in the booklet "Thermal Test Coefficients of Aluminum Insulation for Buildings," published by the American Society of Heating & Air-Conditioning Engineers. A free copy, and samples of the new insulation sent by us on request.

*Patent applied for

COST OF EDGE-TO-EDGE INFRA
Multiple Aluminum Insulation installed in new construction between wood joists, material and labor

Type 6-PS about 10¢ sq. ft. Type 4-PS about 8¢ sq. ft.

Infra Insulation, Inc., 525 Broadway, N. Y., N. Y., Dept. H-5
☐ Please send FREE A.S.H.A.C.E. Booklet, "Thermal Test Coefficients of Aluminum Insulation for Buildings."

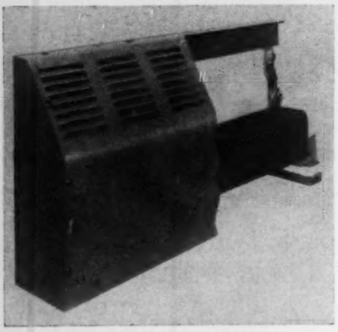
Name______________________________

Firm______________________________

Address____________________________

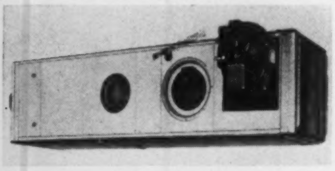
Structural Insulation . . .

. . .of cellular glass material, called "Duraface Foamglas"—Pittsburgh Corning Corp., 1 Gateway Center, Pittsburgh 22. Combines insulation and ceramic finish in single unit. Has hard white crust on face. No finish coating required to protect. Can be installed in one operation, shown.



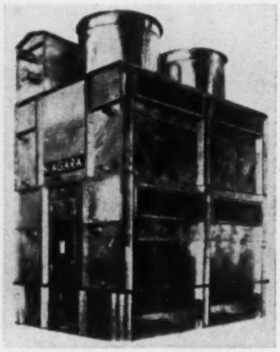
Enclosures . . .

. . .for fin pipe radiation—Stedco Products, Wilkes-Barre, Pa. "Thermo-Lux" available for single, double, triple tier installations. Will accommodate 15 sizes, capacities of company's "Hi-Therm" radiation. Has special wall bracket for mounting and adjusting.



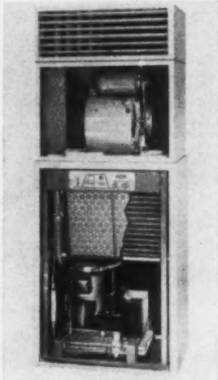
Oil-Fired Furnace . . .

. . .for suspended installations—Henry Furnace Co., Medina, Ohio. Moncrief "PY-224-E" has 224,000 Btu output rating at bonnet. Features cylindrical heat exchanger. High pressure gun type oil burner. Forced air circulation supplied by 12 in. blower, powered by ½ hp motor operating at 2800 cfm.



Ammonia Condenser . . .

. . .with 200 ton refrigeration capacity—Niagara Blower Co., 405 Lexington Ave., New York 17. Evaporates sprayed water from surface of condensing coils. Air stream enters top of condensing section, is drawn downward through water sprays, over coils, upward to leave unit through propeller fans at top. Unit equipped with "Duo-Pass" precooling coil to remove superheat from gas and make it close to condensing temperature before entering sprayed, condensing section.

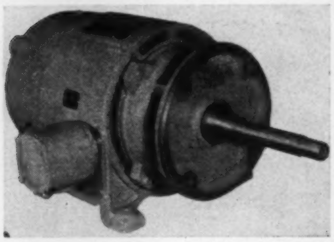


Air Conditioners . . .

. . .in 2, 3, 5, 7½ ton sizes, air and water cooled—Mitchell Mfg. Co., 2525 N. Clybourn Ave., Chicago. Features "Slide-A-Way" chassis with cleanable condenser, "Electromagic" filter eye. In three sections: hermetically sealed cooling system; blower section to be mounted in variety of ways; plenum chamber to provide front, side, rear discharge.

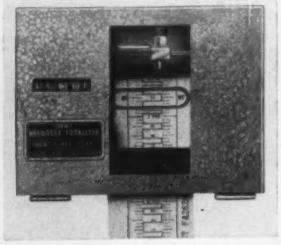
Pump Motors . . .

. . .for centrifugal pumps in dangerous, damp or dusty locations—U.S. Electrical Motors, Inc., Box 2058 Terminal Annex, Los Angeles 54. Totally enclosed, explosionproof design. Cited features: face type registered mounting bracket for accurate shaft alignment; simplified pump mounting; shaft for accurate impeller mounting; solid flange and brass slinger for liquid deflection.



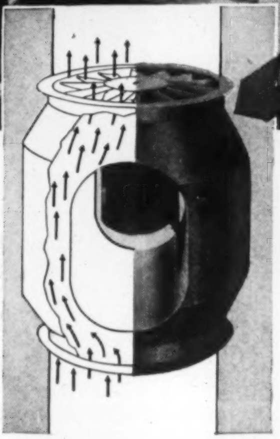
Welder . . .

. . .with range of 5 to 300 amp—Hobart Bros. Co., Troy, Ohio. Electric motor driven, d-c. Resistance unit, said to make possible low welding heat, mounted under special hood on back of control cabinet to dissipate heat outside welder.



Recorder-Totalizer . . .

. . .for heating systems—Heat-Timer Corp., 657 Broadway, New York 12. Portable unit is said to record complete operation of system to which attached. Indications on tape show *on* and *off* periods. 155/220 volt, a-c, 60 cycles.



This fan exhausts corrosive fumes without 90° bend loss

You can have a more efficient fume-removal system with DeBothezat Bifurcator® Fans. These fan units exhaust hot, corrosive and explosive fumes the *direct* way, with no directional change in the air stream to cause pressure losses.

The Bifurcator is a direct-driven fan in a divided housing. Fumes bypass the motor which always stays clean, cool and accessible. A Bifurcator Fan is easily installed . . . just like a flanged section of ductwork. It can be mounted vertically, horizontally or at any angle. Lightweight and compact, a Bifurcator requires no platforms or supports.

Bifurcators are available in sizes from 1140 CFM (12" diameter fan with 1/20 HP motor) up to 45,000 CFM (48" diameter fan with 20 HP motor). Housings and fan wheels can be constructed of cold rolled steel, stainless steel, steel rubber covered, monel metal, and many other corrosion-resistant materials. They can also be coated with Heresite, Ucilon, Tamanite, Herecrol R-9 sprayed synthetic rubber and other coatings.

Be ready with all the Bifurcator facts next time you have a fume-removal problem. Send the coupon for free bulletin. Also get "Design Data for Exhaust Systems," a helpful booklet with simplified data and charts.

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New Wheelco Combustion Safeguards

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Manual or automatic models
Electrode
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A totally new standard in combustion safeguards for all fuels!

For all types of commercial and industrial heating equipment . . . whether gas- or oil-fired . . . the *all-new* Wheelco Flame-otrol gives you a new measure of protection against flame failure hazards, plus wider selection of detection systems for maximum design flexibility, ease of installation, and freedom in choice *and use* of burners, pilots, and fuels.

Manual or *automatic* models give you total burner and fuel shutdown, plus true "safe-start" operation, with automatic delay for the safe-start circuit!

Phone your nearby Wheelco Representative for help in designing and installing a properly integrated *electronic* combustion safeguard system for single- or multiple-burner applications.

Write for complete facts

Helps you specify . . . gives you information on six outstanding design features of the *all-new* Wheelco Flame-otrols . . . describes exclusive user-benefits never before offered in a low-cost instrument. Write for Bulletin F-6570, *today!*

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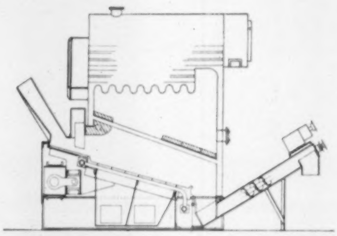
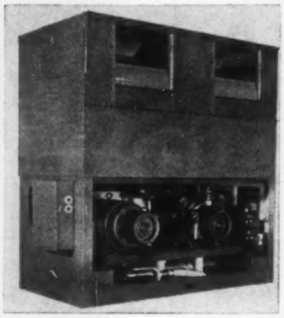
EQUIPMENT DEVELOPMENTS

Continued



Steam Generator . . .

. . . designed for compact automatic operation in commercial, small industrial uses—Bituminous Coal Research, Inc., 2609 First National Bank Bldg., Pittsburgh 22. Anticipated size range is 1500 to 20,000 lb per hr of steam, pressures to 300 psi. Said to be applicable for space heating, process hot water, high pressure process steam installations.



Air Conditioner . . .

. . . with 30 ton capacity—Typhoon Air Conditioning Co., Inc., 505 Carroll St., Brooklyn 15. Machinery free floated on springs so not in contact with cabinet. Designed as free standing unit or with ductwork as central system. Operates at lower capacities when full load not needed.

Duct Connectors . . .

. . . in three flexible types—Grant Wilson, Inc., Board of Trade Bldg., Chicago 4. "Flexi-Duct" is woven asbestos flexible tape. "Vibra-Stop" is asbestos or canvas sealed between

BARBER COLMAN

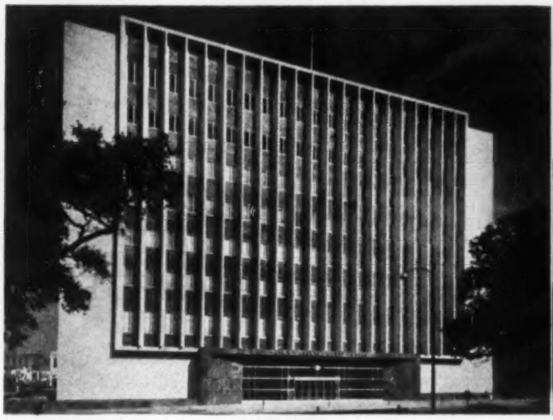
LINE-O-FLO ENGINEERED

Air Distribution

. . . accents architectural design of court house!

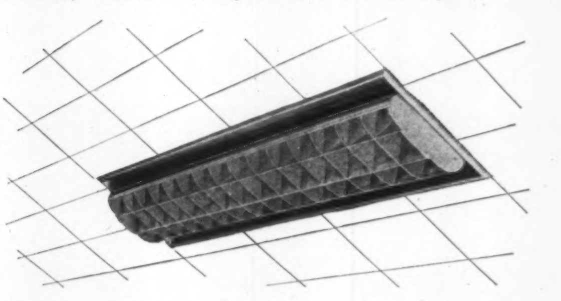
County fathers in Houston, Texas, took no chances when they were approving a $1,500,000 conditioned air system for the new $11,000,000 Harris County Court House. Barber-Colman equipment was specified throughout this modern structure, assuring finest possible end results from the sizable investment in conditioning apparatus. Air is distributed efficiently, quietly, unobtrusively, for heating, cooling, and ventilating from the Line-O-Flo and Venturi-Flo Ceiling Diffusers, and the Uni-Flo Sidewall Diffusers and Return Grilles. Not only are the results above par, but the air distribution units are easier to install, harmonize beautifully with the contemporary design, and last a lifetime with a minimum of service.

Architects: FINGER & RUSTAY. *Mechanical Engineer:* I. A. NAMAN. *General Contractor:* MANHATTAN CONSTRUCTION CO. *Mechanical Contractor:* CHARLES G. HEYNE AND COMPANY.

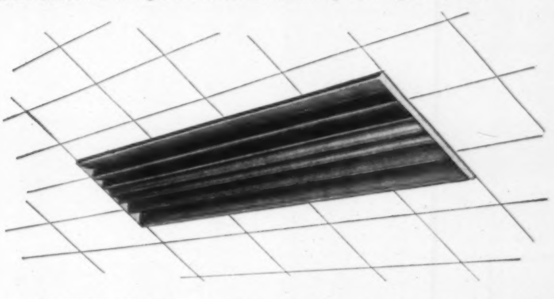


Eight-story court house, except for the jail area, is completely air conditioned. Four primary systems, located on the roof, heat, cool, ventilate, and control humidity as outside conditions require.

Line-O-Flo Ceiling Diffusers in lobby and court room areas quickly equalize temperature differential between supply and room air, preventing stratification and eliminating drafts. Combine readily with light fixtures.

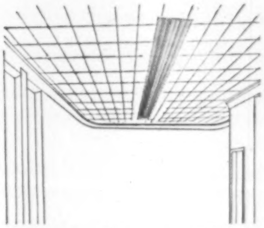


Model LL Line-O-Flo is designed to receive a Day-Brite light unit, which is isolated from the air stream. Flange arrangements permit individual or continuous mounting.



Model LS Line-O-Flo, as used in Harris County Court House, provides positive control of air volume, plus uniform distribution over entire length. Individual or continuous mounting.

BLAZING THE TRAIL TO BETTER AIR DISTRIBUTION



***First* with widely accepted line-type air distribution**

Desire of architects and engineers for continuity of design in modern architecture led Barber-Colman Company into development of Line-O-Flo air distribution equipment. These were the first successful line-type outlets on the market. Scientifically designed, rolled steel members provide rigidity. Two models are available with flange arrangements for individual, or continuous strip installation. One Line-O-Flo model is designed to receive a fluorescent light unit. Both models are dimensionally co-ordinated for use with acoustical ceilings and other building products. Either may be used for supply (with balancing dampers) or return units. Reliable performance data is available on Line-O-Flo and all other Uni-Flo products. For literature, prices, and expert engineering help, phone our nearby Field Office, or write us.

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Air Distribution Products • Automatic Controls • Industrial Instruments Aircraft Controls • Small Motors • Overdoors and Operators • Molded Products • Metal Cutting Tools • Machine Tools • Textile Machinery

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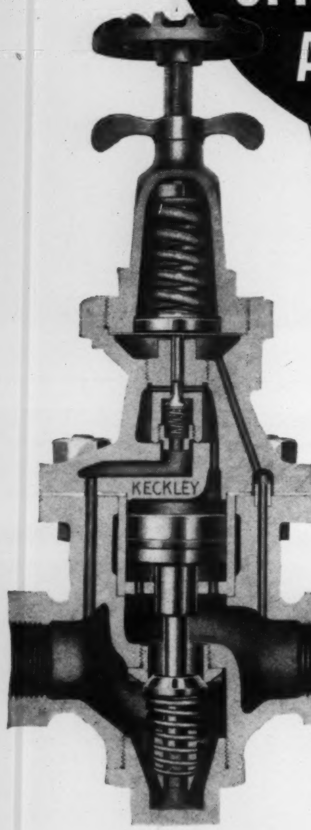
KECKLEY

PRESSURE REGULATORS OFFER ALL THESE ADVANTAGES



- Tested with steam for dead end service.
- No change of springs for different pressures.
- Stainless steel springs to insure long life.
- Phosphor bronze diaphragm.
- Stainless steel "unit pilot valve."
- Copper asbestos gaskets.
- Piston above flow, operation not affected by sediment.
- Bronze or monel renewable cylinder liner.
- Cast iron piston rings.
- Government bronze castings suitable for high temperatures.
- Stainless steel main valve and seat.
- Renewable features.
- No stuffing boxes, dash pots or weights.
- Guaranteed.
- Order one for test—no obligation.

Tested and approved—U. S. Navy for design · materials · workmanship and operation.

Type AA Keckley Pressure Regulator

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Pressure Regulators • Temperature Regulators • Float Valves
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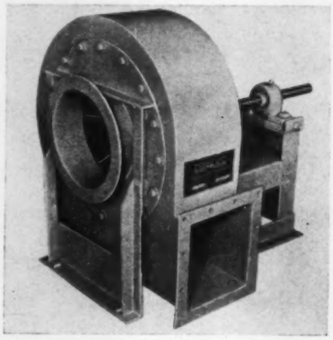
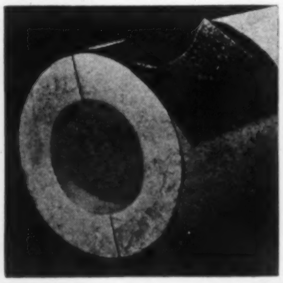
galvanized metal strips. Said to stop noise on heating, ventilating, air conditioning installations. Comes in rolls that pull out as needed.

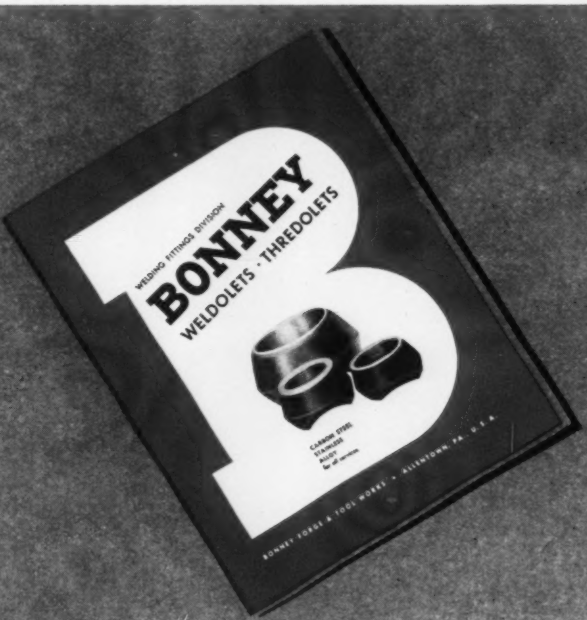


Industrial Fans . . .
. . . for air handling applications—Dracco Corp., Harvard Ave. at E. 116th St., Cleveland 5. Are said to provide service in operations involving gases, air entrainment materials. Specialized units available for gases to 800 F, corrosive materials, explosives. Size range: inlet diameters, 11 to 38 in.; capacities, 500 to 46,000 cfm.



Silica Pipe Insulation . . .
. . . called "Fibrocel"—Johns-Manville, 22 E. 40th St., New York 16. For hot, cold and chilled water lines, low pressure steam pipes, dual service heating and cooling systems. Is said not to shrink or expand and to resist deformation. Die formed to fit.

Air Conditioners . . .
. . . in 3 and 5 ton capacities for stores, restaurants, offices—Coleman Co., Inc., Wichita. Adjustable louvers


WELDING FITTINGS DIVISION
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WELDOLETS · THREDOLETS
CARBON STEEL
STAINLESS
ALLOY
for all services
BONNEY FORGE & TOOL WORKS • ALLENTOWN, PA., U.S.A.

new
1955
catalog

WELDOLETS
THREDOLETS
SOCKET WELDOLETS

. . . illustrating when and where to use them. Specific areas of application shown, also correct installation procedure and featuring these new developments:

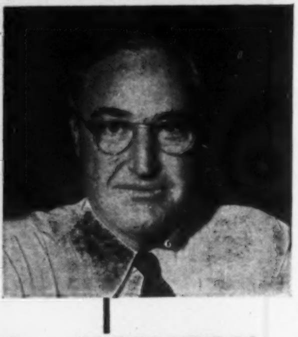
1 Reduced inventory—size consolidation for interchangeability. **2** Thredolet rating addition—3000# and 6000#. **3** Complete range of stainless, alloy and non-ferrous materials. **4** Curvatures for additional pipe sizes through 36" and for caps, heads and flat surfaces. **5** New marking standard. **6** Weldolet Split Tees for complete encirclement reinforcement.

The new 1955 Bonney catalog will be mailed to you promptly upon request.

WELDING
FITTINGS
DIVISION

BONNEY FORGE & TOOL WORKS
715 MEADOW STREET, ALLENTOWN, PA.

"We've standardized on Janitrol...
400 units proved in long service"



AT REED ROLLER BIT CO., HOUSTON

says Mr. S. P. Robertson
Chief Industrial Engineer

"Janitrol heating equipment has been in use here at Reed Roller Bit Company for many years. Its satisfactory service record having been proved, we have for obvious reasons of efficiency and economy standardized on Janitrol throughout our expanding manufacturing facilities", states Mr. Robertson.

Reed Roller Bit now has over 400 units in year 'round use for heating in winter and ventilation in summer. The durability and performance of Janitrol in this and similar installations is again evidence of *proved* value in both equipment and installation.

Janitrol Unit Heaters are suspended over production area and directed to "spot" the heat just where required.

For more information on the use of unit heaters in many types of buildings write for your copy of "Businessman's Blue Book of Better Heating".

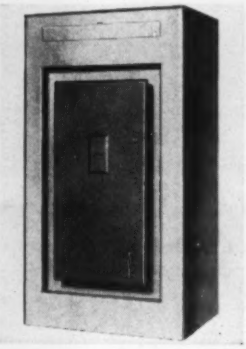
Janitrol
GAS-FIRED UNIT HEATERS

Janitrol Heating & Air Conditioning Division
Surface Combustion Corporation, Columbus 16, Ohio
In Canada: Alvar Simpson Ltd., Toronto 13

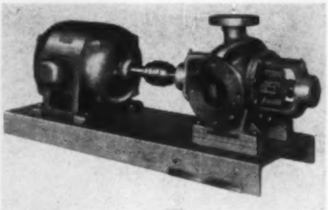
ALSO MAKERS OF Surface INDUSTRIAL FURNACES AND Kathabar HUMIDITY CONDITIONING

EQUIPMENT DEVELOPMENTS

Continued

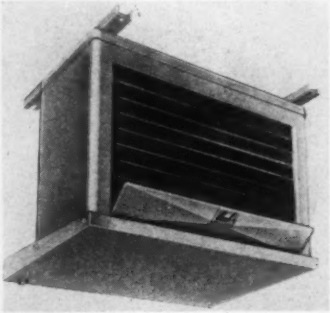


in top give one- to four-way air circulation where ducts not used. Compressor, evaporator, condenser, refrigerant connections hermetically sealed.



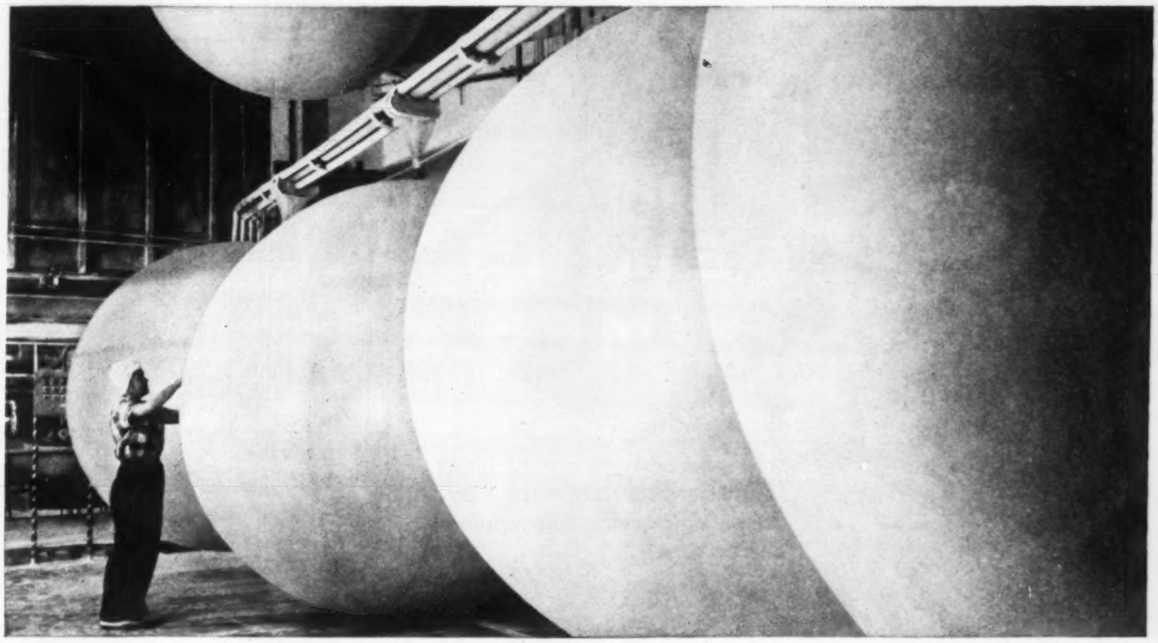
Power Plant Pumps . . .

. . . for boiler feed service with boilers to 1000 hp, pressures to 300 psi —Roy E. Roth Co., 2420 4th Ave., Rock Island, Ill. Two stage regenerative pumps have low pressure stuffing boxes, balanced shaft loading. In two series of 19 models.



Unit Coolers . . .

. . . with "Inner-Fin" finned coil design—Bush Mfg. Co., 179 South St., West Hartford, Conn. Two types: "HG," hot gas defrost; "ED," electric defrost. With kits comprising timer and controls. Units defrost from inside. Finned coil design is said to provide rapid heat distribution.



WEATHER BALLOON MAKER SAVES $2500 A YEAR WITH KATHABAR EQUIPMENT

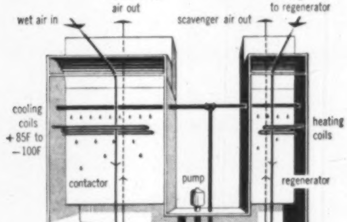
Kathabar humidity conditioning provides the right weather for making weather balloons. The Dewey and Almy Chemical Company obtains 40-grain air without frost, expensive over-cooling and re-heating, or duplicate coils. The system's coolant is 75°F water. *Results:* annual saving of $2500 in operating costs—and faster production of their balloons.

Here's how their two-zone system works. In the first zone, ground level, latex balloon gels are inflated from one-fourth to full size. Moisture between latex particles is a necessary lubricant during gel inflation. The maintained air conditions average 70°F, 50% RH.

Second zone, an 80-foot drying tower, is held at 100°F and 20-30% RH for final drying. The moisture must be removed at a controlled rate—not too fast or the balloons rupture; not too slow or production is impeded. Temperatures over 100°F would cause a spotty pre-cure.

This is a typical example of how Kathabar humidity conditioning has solved industrial air conditioning problems for 20 years. Your Kathabar system representative can show you how to dictate *your* production weather. As a trial balloon, write for Literature Group K54-2.

WHAT COULD BE SIMPLER?



Air to be conditioned passes through the contactor, where an absorbent solution removes moisture (the amount depends on the automatically-controlled temperature of the solution). In the automatic regeneration, about 15% of the solution is heated, and the moisture it releases is blown out the window.

Kathabar®
HUMIDITY CONDITIONING

SURFACE COMBUSTION CORPORATION • TOLEDO 1, OHIO

ALSO MAKERS OF **Surface** INDUSTRIAL FURNACES **Janitrol** AUTOMATIC SPACE HEATING

EXPEDITE PUMP SELECTION
for Air Conditioning Systems

SPECIFY
DEMING
PUMPS

These standard pumps have characteristics that make them highly efficient for air conditioning service.

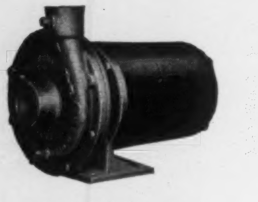


Fig. 4350 Series
"MOTOR-MOUNT" Centrifugal Pump. Designed to permit mounting on any motor having "NEMA" type "C" mounting flange. Capacities range to 200 G.P.M.

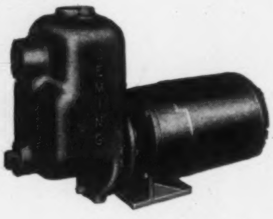


Fig. 3350 Series
Self-Priming type of "MOTOR-MOUNT" Centrifugal Pump. Priming is rapid, automatic, and foolproof. Non-siphoning feature. Capacities range to 140 G.P.M.

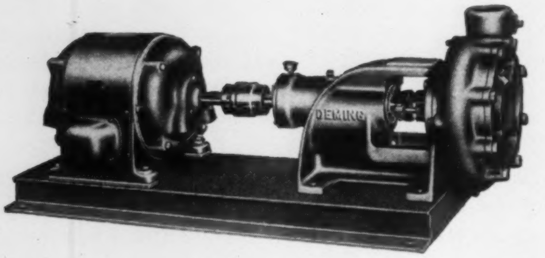


Fig. 4011 Series
These end suction centrifugal pumps are ideally suited for air conditioning service. 4-piece liquid end assembly permits easy service and maintenance. Two ball bearings supporting the shaft are mounted on heavy duty, streamlined support head. Many other top quality features. Capacities range to 1,000 G.P.M.

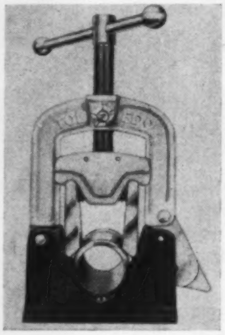
Send for Free Bulletins

Complete details and performance tables on the Deming Centrifugal Pumps illustrated are available in Bulletins 4355A, 3350, and 4011. Write for free copies.

75th
ANNIVERSARY
DEMING
PUMPS
1880 - 1955

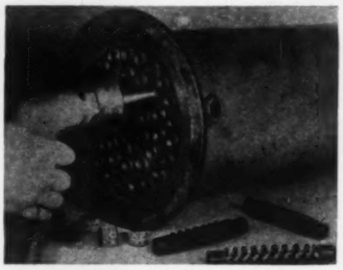
THE DEMING COMPANY
560 Broadway • Salem, Ohio

EQUIPMENT DEVELOPMENTS
Continued



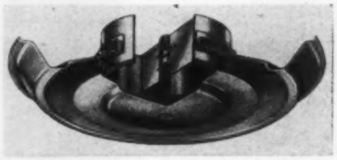
Pipe Vise . . .

. . . with jaws designed for firm gripping action without crushing—Toledo Pipe Threading Machine Co., Toledo. Will grip pipe ⅛ to 2½ in. Also irregular shapes (valves, tees, ells).



Condenser Cleaner . . .

. . . for removing soft deposits in refrigeration—Thomas C. Wilson, Inc., 21-11 44th Ave., Long Island City 1, N.Y. "Blo-Gun" uses plug shooting or washing method. Used with either corded rubber plug or nylon spiral brush. Has aluminum housing with removable bronze nozzle and rubber spray shield.



Ceiling Air Diffuser . . .

. . . with high induction air stream—Connor Engineering Corp., Danbury, Conn. Incoming air deflected from ceiling by built in cone. Calibrated, sleeve type damper regulates air volume. Assembly of inner cone and damper snaps in and out as unit. In 4 to 12 in. neck diameter.

LOOKING FOR QUALITY BRONZE GLOBE VALVES?

Be sure to check the O-B Lineup

You can find just the globe valve you need in this lineup of 100 and 125-pound (WSP) valves. Note that at the 100-pound level you have a choice of a brass disc valve (No. 201) or a renewable disc valve (No. 301).

Other O-B Globe Valves, including those with higher pressure ratings, are described in Bulletin 1322-V which is available on request. Your O-B distributor can give you complete information on all O-B valves...globes, gates, checks and valves designed especially for air conditioning installations. Why not call him today?

Ohio Brass

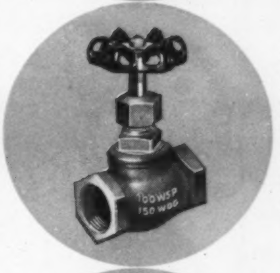
MANSFIELD OHIO, U.S.A.

4569-V

100 WSP
150 WOG

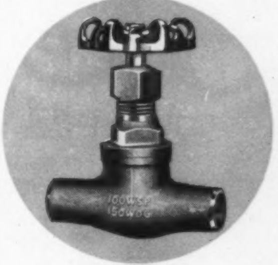
No. 201 GLOBE

100 Lbs. W.S.P.
150 Lbs. W.O.G.
Brass Disc
Sizes—⅛ through
3 inches



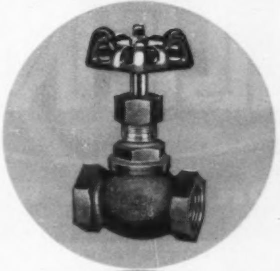
No. 301 GLOBE

100 Lbs. W.S.P.
150 Lbs. W.O.G.
Composition Disc
Sizes—¼ through
2 inches
Available with drain—⅜
through 1 inch
(Fig. No. 308)



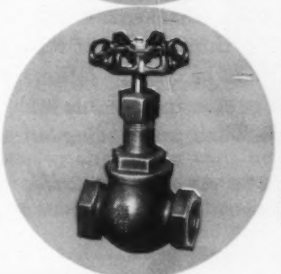
No. 601 GLOBE

100 Lbs. W.S.P.
150 Lbs. W.O.G.
Solder Type
Composition Disc
Sizes—⅜ through 1 inch
Same sizes available
with drain
(Fig. No. 608)



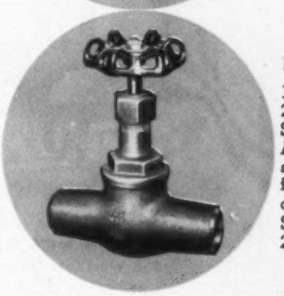
No. 101 GLOBE

125 Lbs. W.S.P.
200 Lbs. W.O.G.
Brass Disc Sizes—⅛
through 3 inches



No. 1501 GLOBE

125 Lbs. W.S.P.
200 Lbs. W.O.G.
Available with hard
steam disc, or soft disc
for use on water, oil
or gas.
Sizes—¼ through
2 inches



No. 1601 GLOBE

125 Lbs. W.S.P.
200 Lbs. W.O.G.
Solder Type
Available with hard
steam disc, or soft disc
for use on water, oil
or gas.
Sizes—¼ through
2 inches

the man
on the job
can tell you...

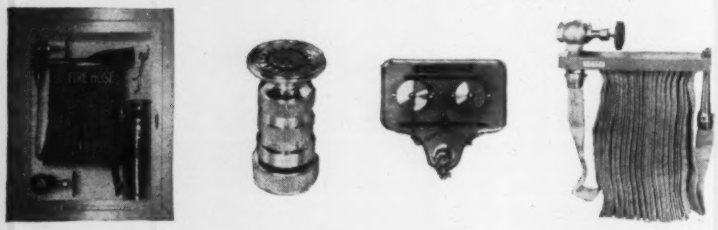
it pays
to figure on

ALLENCO

INTERIOR FIRE-PROTECTION

"**Allenco** makes everything that might be called for in standpipe-type fire protection. Their prices and deliveries are reliable. Some of their items actually cut installation costs. Never had any trouble with them, and they're bringing out new things all the time."

✓ *figure next job with* ALLENCO



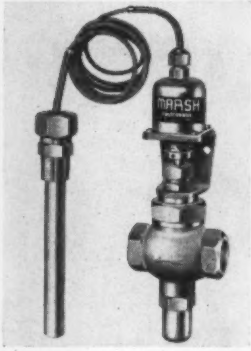
Established 1887

W. D. ALLEN MANUFACTURING CO.

709 Allenco Bldg. 566 West Lake Street Chicago 6
25 Sales Offices • New York 7

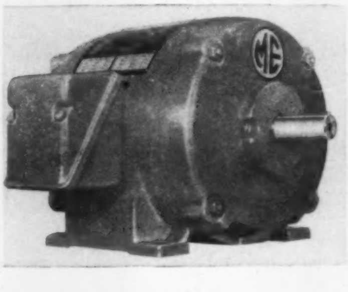
EQUIPMENT DEVELOPMENTS

Continued



Fluid Control Valves . . .

. . . for cooling or heating—Jas. P. Marsh Corp., Skokie, Ill. In two models. "WT" controls flow of water, brine, oil, air, gas, etc., for cooling. Opens with rise in temperature, closes with drop. "HT," for hot water or low pressure heating steam, closes with temperature rise, opens with fall. Various sizes available for both in direct (3/8 to 3/4 in. FPT) and pilot ("WT," 1 to 4 in., "HT," 1 to 2 in.) operated types. Bulb types selected for medium to be controlled.



Integral HP Motor . . .

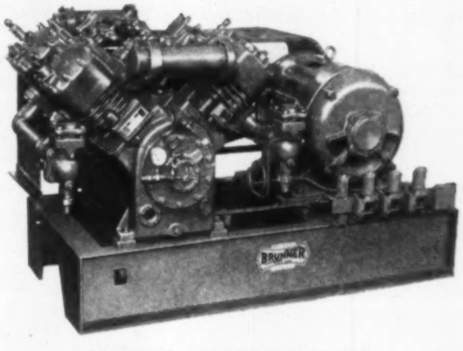
. . . is designed to be drip-proof, splash-proof, weather protected—Marathon Electric Mfg. Corp., Wausau, Wis. May be mounted overhead, side wall, floor. Cast iron brackets, frame. Single, three phase ratings. Also in enclosed, fan cooled design.

Cooling Towers . . .

. . . with design improvements—Havens Structural Steel Co., 1713 Crystal Ave., Kansas City, Mo. Models have one motor and fan. Redesigned redwood fill is said to give maximum air flow with minimum horsepower and no increase in drift. Cold water screen lifts out to clean.

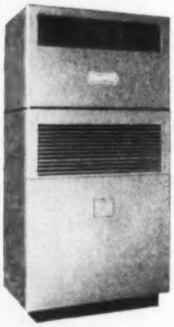
Brunner planned it that way...

OK
BRUNNER
SINCE 1906



BRUNNER CONDENSING UNITS

. . . for remote air conditioning installation in commercial and industrial applications, are supplied in sizes up to 75 H.P. with capacity control. Brunner Compressor Units for use with evaporative condensers also available up to 75 H.P.



BRUNNER AIR CONDITIONERS

. . . completely self-contained, are available in various models up to 20 H.P. for residential or business installations. Easy to install, cost less to operate.

By choosing BRUNNER for dependable performance, thousands of users of Brunner Air Conditioners and Refrigeration Condensing Units have put their OK on Brunner quality.

This is not just a lucky coincidence . . . we planned it that way! Right at the beginning, we made up our minds that we were interested in producing only the best . . . and we've held to this objective for half a century.

Brunner "OK quality" is built into the product, step by step, from start to finish . . . pays off in finer performance, more years of trouble-free service, and lower operating costs. "SELL BRUNNER" with complete confidence that you are serving the best interests both of your customers and yourself.

Brunner offers a complete line of Refrigeration and Air Conditioning Condensing Units and Packaged Air Conditioners. See your Brunner representative, or write to:

BRUNNER MANUFACTURING COMPANY, Dept. L-555, UTICA, N.Y.
The Brunner Co., Gainesville, Ga.
In Canada: Brunner Corp. (Canada) Limited, Toronto, Ontario

BRUNNER
SINCE 1906

BRUNNER EXTRAS

- Compressor Experience
- Product Research
- Design Engineering
- Wide Product Range
- Proven Quality
- Complete Dependability
- Easy Servicing
- Warranted Performance
- Nearby Distributor Service
- Profit Opportunity
- Advertising Support
- Sales Promotion Help

Wing
REVOLVING UNIT HEATERS

The Moving Airstream
Touches the Worker
for only a few Seconds
at a Time

NO SICKENING HOT BLAST!

That is the big difference between all other unit heaters and the WING Revolving Heater. The soft airstream from the slowly revolving discharge outlets creates a warm, gentle, yet live sensation of comfortable well-being that is without equal for keeping workers contented and productive.

...And in the Summertime with the steam turned off and the fans on, these same revolving discharge outlets will create a pleasing, cooling effect on the hottest days.

L. J. Wing Mfg. Co.
140 Vreeland Mills Rd., Linden, N. J.
Factories: Linden, N. J. & Montreal, Canada
In Europe: Etab. Wanson, Brussels, Belgium

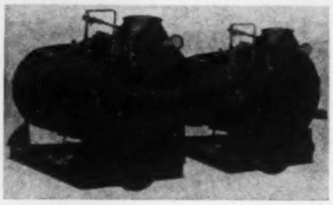
Wing

L. J. Wing Mfg. Co., Linden, N. J.
Please send me Bulletin HR-6A-Revolving Heaters
Name....................................
Firm....................................
Address.................................
City................Zone......State..........

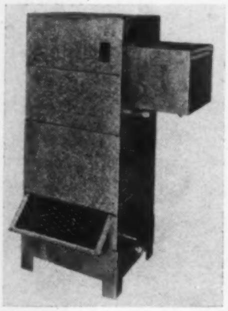
UNIT HEATERS
FANS
BLOWERS
DRAFT INDUCERS
TURBINES

EQUIPMENT DEVELOPMENTS

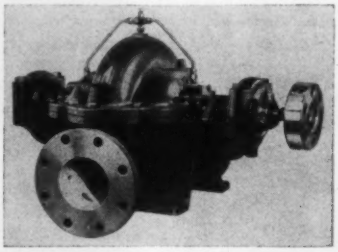
Continued



Twin Package Boilers . . .
. . .that are said to deliver 10,000 lb per hr of steam in 728 cu ft plant space—Cyclotherm Div., National-U.S. Radiator Corp., Oswego 2, N. Y. Operating pressures to 200 psi. With variable capacity burner nozzles. Burn oil, gas, or combination. Are said to produce economically at one-third rated capacity.



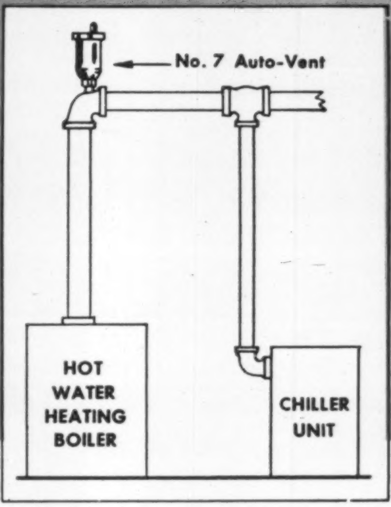
Cooling Tower . . .
. . .with centrifugal blower fan—Marley Co., 222 W. Gregory Blvd., Kansas City, Mo. "AquaCooler" induced draft, counter flow tower in five models, 3 to 15 tons. Pressure spray system and redwood filling are said to achieve maximum water break up, cooling. Installed indoors or outdoors. Heavy gage steel basin, casing.



General Purpose Pump . . .
. . .for air conditioning, other uses—Allis-Chalmers Mfg. Co., Milwaukee 1. Double suction pump has hori-

RELEASE THOSE INVISIBLE AIR BRAKES

that strangle circulation and reduce efficiency in HOT WATER HEATING and Chilled Water COOLING



install . . .

MAID-O'-MIST AUTO VENTS

Automatic air valves for every venting need!

AIR IS A BRAKE which slows or stops water circulation in any hot water heating or chilled water cooling system. Sluggish circulation cuts efficiency, often calls for frequent and expensive call-backs for manual venting.

To maintain free circulation, the system *must* be kept free of air. And air release should be automatic.

Maid-O'-Mist float-operated, continuous-venting Auto-Vents are highly praised for the job they do in air elimination. Easily installed in trouble spots, Auto-Vents are always ready to work . . . always trouble-free.

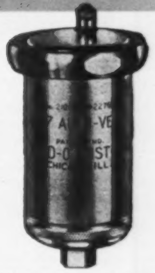
Maid-O'-Mist Auto-Vents will meet your heating and cooling air elimination needs. Get full information from your jobber or write for catalog, *today!*

NO. 7 AUTO-VENT

For Vertical Mounting Only

Self-Closing, float-controlled valve . . .non-ferrous metals . . . no air chamber required . . . designed for working pressures up to 75 lbs.

No. 7 Auto-Vent—size 4⅜" x 2¼" with ⅛" I.P. female connection.



NO. 27 AUTO-VENT

For Horizontal Mounting only

Dependable float-operated valve . . . non-ferrous metals . . . no air chamber required . . . for working pressures up to 50 lbs.

No. 27 Auto-Vent—size 3" x 2½" with ⅛" I. P. female side connection.

NO. 67 AUTO-VENT

For Vertical Mounting only in Limited Space

Self-closing, float-operated . . . compact size . . . non-ferrous metals . . . no air chamber required . . . for working pressures up to 30 lbs.

No. 67 Auto-Vent—size 3-3/16" x 1½" with ⅛" I.P. female connection.

MAID-O'-MIST Inc.
HEATING SPECIALTIES

AUTOMATIC HUMIDIFIERS . . . . . AUTO-VENTS
WATER LINE CONTROLS . HEATING SPECIALTIES
MAID-O'-MIST, Inc.
3217 NORTH PULASKI ROAD . CHICAGO 41, ILL.

you get custom-made results
with factory-made hangers and eliminators

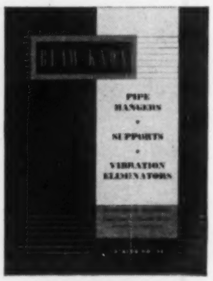
Each is a complete packaged unit, designed to serve a particular purpose.

So when you use our functional spring hangers . . . which have the Blaw-Knox patented *internal swivel action* . . . and our constant support spring hangers and vibration eliminators, you get custom-made results. And that holds good for rigid hanger assemblies and overhead roller assemblies.

Proper selection cuts your engineering time and expense . . . yet enables you to meet the most exacting standards. Each is ready to install, so you eliminate expensive cutting, threading and assembling in the field.

Our engineers, who have solved many tough hanger and piping vibration problems, are always available to both design and make recommendations for your hanger requirements.

BLAW-KNOX COMPANY
Power Piping and Sprinkler Division
Pittsburgh 33, Pennsylvania

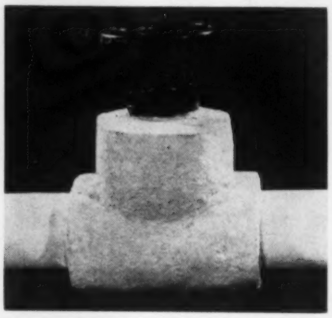


For more information on our complete line, write for your copy of Bulletin No. 54.

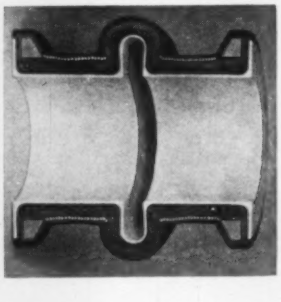
BLAW-KNOX
PIPE HANGERS

Complete line of functional spring hangers • constant support spring hangers • rigid hanger assemblies • overhead roller assemblies • supports • vibration eliminators . . . plus complete prefabricated piping systems for all pressures and temperatures

zontally split, cast iron casing, bronze double suction type impeller, sealed and grease lubricated ball bearings, deep but accessible stuffing boxes. In sizes from 3 × 2½ in., 1750 rpm, at 150 ft head to 6 × 6 in., at 100 ft.



Mineral Wool Cement . . .
. . .for insulating-finishing—Baldwin-Hill Co., Trenton, "Super Powerhouse" is said to both insulate and provide smooth, white finish. Made of long, fine fibers of spun mineral wool. Designed for temperatures to 1700 F. In 50 lb bags.



Expansion Joints . . .
. . .of rubber compound for piping; flanges made by Haveg Corp. and Duriron Co.—Garlock Packing Co., Palmyra, N. Y. Rubber combined with plies of cotton duct, reinforced with steel wire. Steel rings in flange ends permit tightening of connections without shearing joint. In 1 to 12 in. pipe sizes.

Solenoid Valve . . .
. . .has direct lift, is designed for low pressures to 7 psi—Automatic Switch Co., Orange, N.J. Stainless steel core and composition disc only moving

Here's PROOF

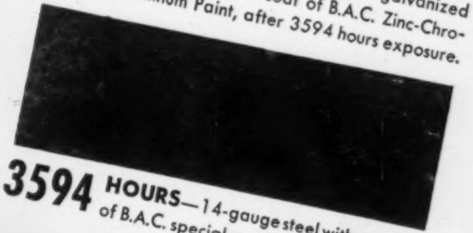
that you get a BETTER FINISH *on* B.A.C. *Evaporative Condensers and Cooling Towers*

While galvanizing in itself provides excellent protection against corrosion, actual salt spray corrosion tests indicate that the addition of B.A.C. Zinc-Chromatized Aluminum Paint over galvanizing increases the corrosion-resisting properties more than 10 to 1 over galvanizing alone. B.A.C. Special Mastic over plain black iron also shows excellent resistance to corrosion.

In the 20% salt spray corrosion tests, the results observed on the test panels were as shown on these unretouched photos.

336 HOURS—14-gauge hot-dipped galvanized steel after 336 hours of exposure.

3594 HOURS—14-gauge mill galvanized steel, with one coat of B.A.C. Zinc-Chromatized Aluminum Paint, after 3594 hours exposure.



3594 HOURS—14-gauge steel with one coat of B.A.C. special mastic after 3594 hours.

B.A.C.

BALTIMORE AIRCOIL COMPANY, INC.
2623 Mathews Street, Baltimore 18, Maryland

EVAPORATIVE CONDENSERS — 10 TR to 300 TR / COOLING TOWERS — 10 TR to 240 TR
. . . in single, factory-assembled units!

The Easy Way to Buy Heating Equipment

PREFERRED UTILITIES

Offers a Single Dependable Source That Saves You Time and Money!

Buying heating equipment from different sources, each with different specifications and standards of quality, can prove as confusing and dangerous as buying a boiler in parts and then having to put it together and make the assembly function properly.

It's simpler, more economical, safer to buy industrial and commercial burner equipment from a single, dependable manufacturer who knows what your jobs require to make all the equipment work right.

Preferred Utilities is a pioneer and leading developer and producer of the most extensive, high quality line of automatic oil burning and combination oil- and gas-burning equipment and accessories—engineered to meet the highest standards of performance.

It will pay you to investigate the advantages of Preferred Utilities heating equipment. Write for bulletins.

PREFERRED UTILITIES MANUFACTURING CORP.
1860 Broadway • New York 23, N. Y

Please send bulletins checked DEPT. HPAC

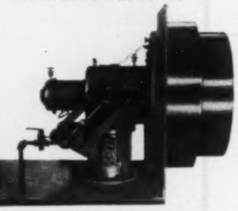
☐ Bull. 175 ☐ Bull. 176
☐ Bull. 185 ☐ Bull. 150
☐ Bull. 1630B

NAME..........
COMPANY..........
STREET..........
CITY.......... STATE..........

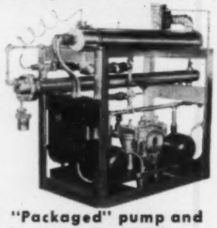
Horizontal rotary, heavy oil burners, 7½ to 175 g.p.h. Bulletin 175.

Combination oil and gas burners 15 to 90 g.p.h. Bulletin 176.

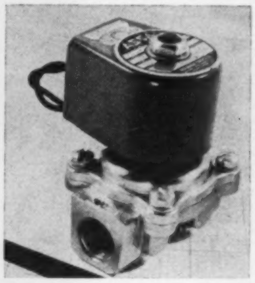
"THERMOPAK" automatic oil or gas combustion system, completely packaged for all boilers. Bulletin 185.



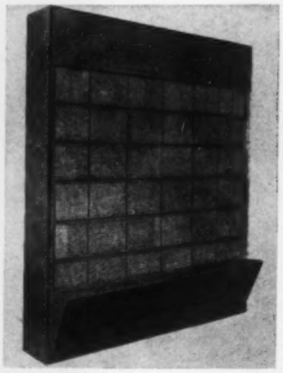
Rotary burners for heavy oil, tar or pitch—50 to 400 g.p.h. Bulletin 150.



"Packaged" pump and heater set; for oil delivery of 110 to 1200 g.p.h. Bulletin 1630B.

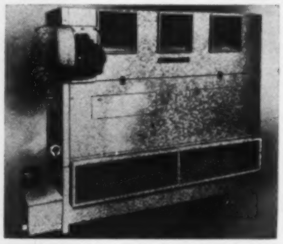


element. Designed as gas pilot control valve for power boilers. Suited for low pressure air, gas control on furnaces. In ⅜, ½ in. pipe sizes.



Air Filters . . .

. . . in 6 ft wide sections—Continental Air Filters, Inc., Louisville. "Ferris-Wheel action" is designed to prevent filtered dirt being blown back into clean air stream from leaving curtain. Aluminum, viscous impingement media.

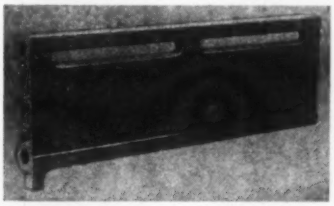


Cooling Towers . . .

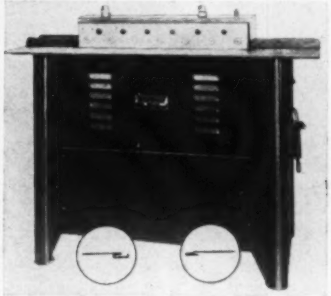
. . . with 15 to 100 ton capacities—Acme Industries, Inc., Jackson, Mich. Centrifugal blowers induce constant velocity air flow for use with ductwork. Uses wetted deck principle of water-to-air heat transfer. Sump is outside of tower for servicing.

EQUIPMENT DEVELOPMENTS
Continued

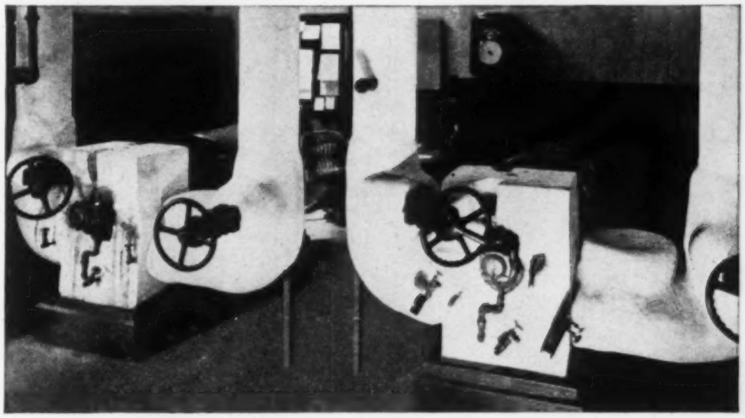
Visible Wedge Valve . . .
. . . designed for full view visibility of wedge, complete shutoff—Hamer Valves, Inc., 2919 Gardenia Ave., Long Beach, Calif. Seats are integral part of body. Wedge and seats have stainless trim for corrosion-resistance. Operator has control of wedge at all times. No lifting to reverse wedge.



Cast Iron Baseboard . . .
. . . for where design, exposure conditions require high heat input—Weil-McLain Co., Michigan City, Ind. In 6 in. increments. Rated at 3.35 sq ft per lineal ft. Legs on end sections position baseboard against wall. Shipped in 6 ft lengths or less.

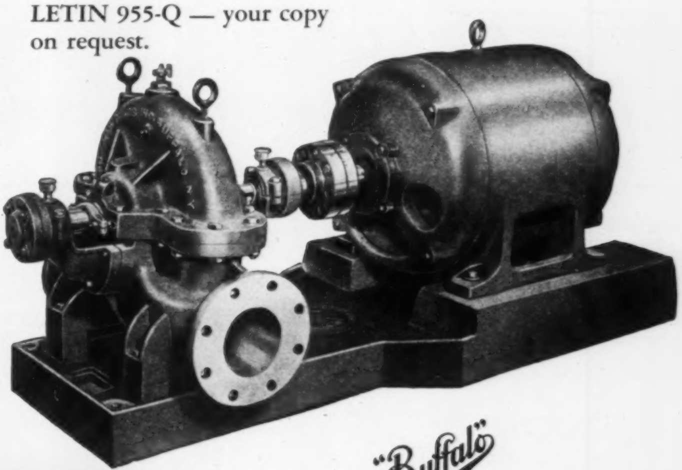


Snap Lock Machine . . .
. . . for fabricating sheet metal duct—Lockformer Co., 4615 W. Roosevelt Rd., Chicago 50. For 24 to 30



UNDER THE INSULATION
— You Want a Pump You Can Trust

Pumps are by no means the most expensive equipment in a refrigeration or air conditioning system like the above — yet the system can function no better than the pumps. Here, certainly, is no place to cut corners. "Buffalo" Type SL Double Suction Pumps have a built-in efficiency and reliability that makes them the SAFE choice for clear water installations. We call this construction the "Q" Factor*. It's been a part of "Buffalo" Pumps for 78 years — and in countless liquid moving jobs, "Buffalo" has proven to be "the pump you can trust."
FULL DETAILS IN BULLETIN 955-Q — your copy on request.



"Buffalo"
TYPE SL DOUBLE SUCTION PUMP

"Buffalo" PUMPS

*The "Q" Factor — the built-in Quality which provides trouble-free satisfaction and long life.

BUFFALO PUMPS, INC.
171 MORTIMER STREET BUFFALO, N.Y.
Subsidiary of Buffalo Forge Company
Canada Pumps, Ltd., Kitchener, Ont.
Sales Representatives in all Principal Cities

A BETTER CENTRIFUGAL PUMP FOR EVERY LIQUID

ACCO
products
R-P&C
DESIGNED FOR
DEPENDABILITY
GATES
GLOBES
&
ANGLES
SWING & LIFT
CHECKS
FITTINGS
8 R 400
STEEL
6 R 300
STEEL
6 R 400
STEEL
6 R 600

R-P&C's complete line of Cast Steel Valves and Fittings

—SIZES UP TO 24"
—PRESSURE CLASSES FROM 150 TO 2500 LBS.

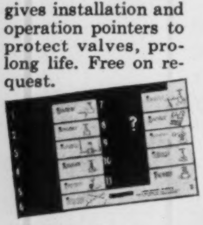
• R-P&C's valve line includes a complete selection of cast steel valves and fittings. These are manufactured in all standard valve steels in a complete range of sizes, pressure classes, and styles.

• Included are gates, globes and angles, swing and lift checks, in a wide range of constructions, and all classes of flanged fittings. Pressure sealed designs for high temperatures and pressures, automatic stop and check valves, and many other special purpose valves and fittings complete the line.

• All R-P&C steel valves and fittings conform to the exacting standards of design and manufacture that users have learned to expect from R-P&C. And all are providing, in many different applications, the dependability that is the R-P&C standard.

See your R-P&C distributor or write for R-P&C's convenient catalog

FREE WALL CHART
"How to Protect Your Valves"
17" x 11" wall chart gives installation and operation pointers to protect valves, prolong life. Free on request.

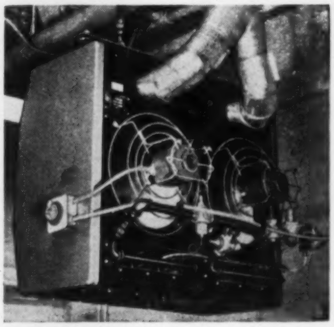


ACCO
R-P&C Valve Division
AMERICAN CHAIN & CABLE
Reading, Pa., Atlanta, Boston, Chicago, Denver, Detroit, Houston, New York, Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.
TRADE MARK
R-P&C valves

gage metal. Fabricates receiver lock, offset lock; round or square duct. Operates on 110, 220 volts.

Baseboard Panel . . .

. . . installation technique—American Radiator & Standard Sanitary Corp., Pittsburgh 30, Pa. "Heatrim" panels cut to size on job, as shown above. Process is said to reduce installation time.



Gas Fired Unit Heater . . .

. . . with 230,000 Btu input—C. A. Olsen Mfg. Co., Elyria, Ohio. "Luxaire" is twin unit of two 115,000 Btu units in single cabinet. Heating elements welded to heat exchanger. Heat generated by ribbon burners with connecting strips designed for prevention of flashbacks. Factory wired, assembled.

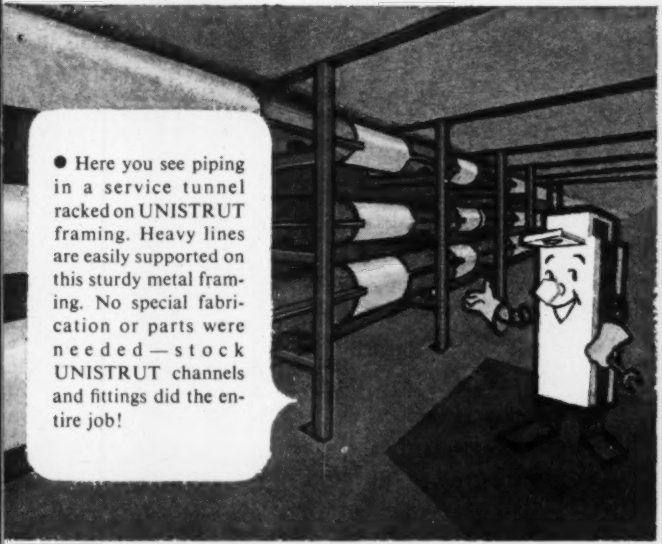
Fractional HP Motors . . .

. . . with $\frac{1}{4}$ to 1 hp ratings in split phase, capacitator-start and polyphase types—Hoover Co., Electric Motor Div., North Plainfield, N. J. Features cited for "Hy-Drive": ribbed base to withstand abuse; 11 gage heavy steel frame; polyester film insulation in

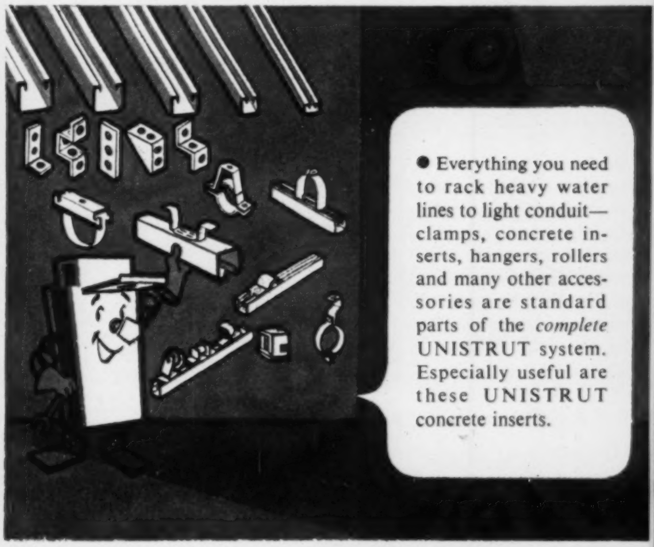
"The Sky's The Limit"

—when you build with UNISTRUT®

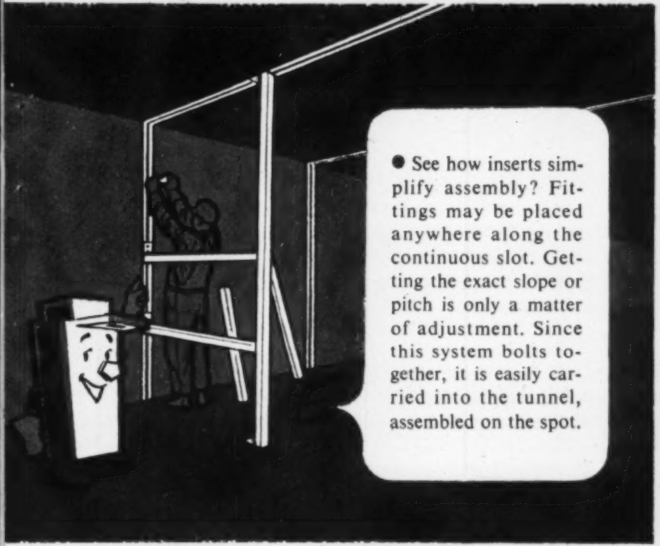
Mr. Strut simplifies pipe racking with cost-cutting UNISTRUT® framing



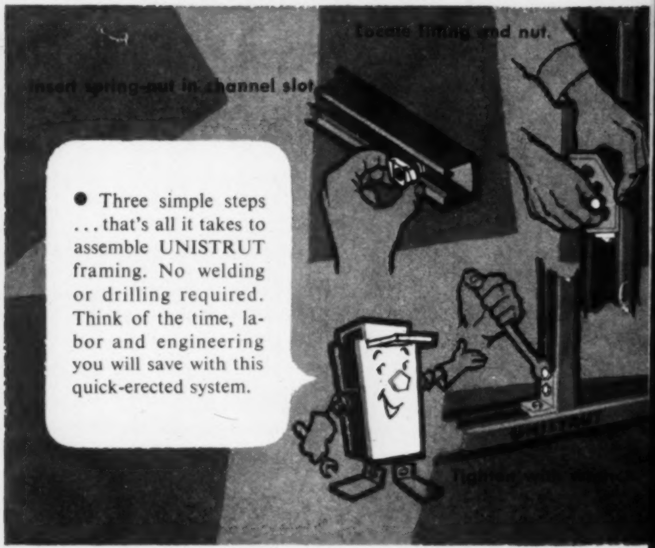
● Here you see piping in a service tunnel racked on UNISTRUT framing. Heavy lines are easily supported on this sturdy metal framing. No special fabrication or parts were needed—stock UNISTRUT channels and fittings did the entire job!



● Everything you need to rack heavy water lines to light conduit—clamps, concrete inserts, hangers, rollers and many other accessories are standard parts of the *complete* UNISTRUT system. Especially useful are these UNISTRUT concrete inserts.

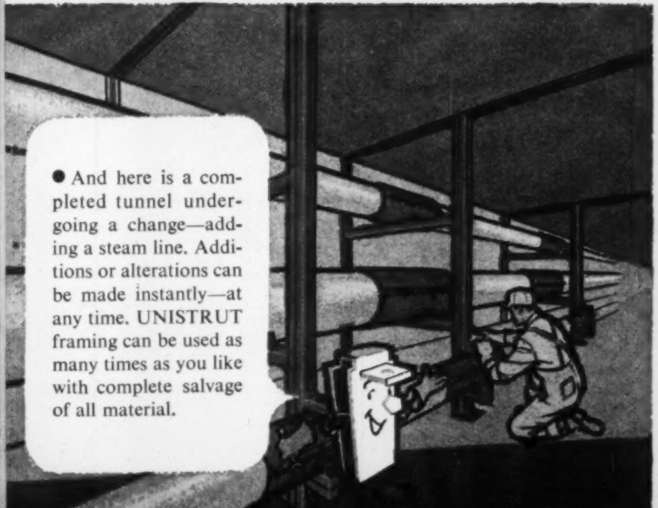


● See how inserts simplify assembly? Fittings may be placed anywhere along the continuous slot. Getting the exact slope or pitch is only a matter of adjustment. Since this system bolts together, it is easily carried into the tunnel, assembled on the spot.



Locate fitting and nut.
Insert spring-nut in channel slot.
UNISTRUT
Tighten with wrench.

● Three simple steps ... that's all it takes to assemble UNISTRUT framing. No welding or drilling required. Think of the time, labor and engineering you will save with this quick-erected system.



● And here is a completed tunnel undergoing a change—adding a steam line. Additions or alterations can be made instantly—at any time. UNISTRUT framing can be used as many times as you like with complete salvage of all material.

Why not take advantage of this versatile system on your next job? You'll find it does a faster, better job for less money. Your UNISTRUT Distributor knows this system well and can assist you in design and engineering. See him for complete information and the new low price of UNISTRUT framing. Send the coupon below for free catalogs. Make a note, too, to see our latest film "The Sky's The Limit" —now at your UNISTRUT Distributor's.

Complete warehouse stocks in all principal cities. In Canada, Northern Electric Company.

The World's Most Flexible All-Purpose Metal Framing

U. S. Patent Numbers

2327587	2380379
2329815	2405631
2345650	2541908
2363382	2696139

Other patents pending

UNISTRUT PRODUCTS COMPANY
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Chicago 7, Illinois

Dept. H-3

☐ mechanical and electrical catalog No. 700
☐ information on UNISTRUT film, "The Sky's The Limit."

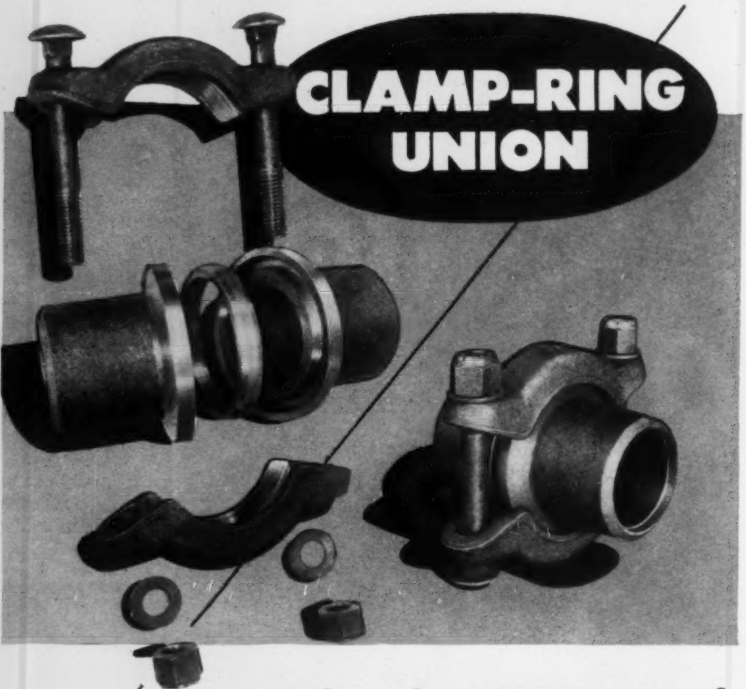
Name..

Address..

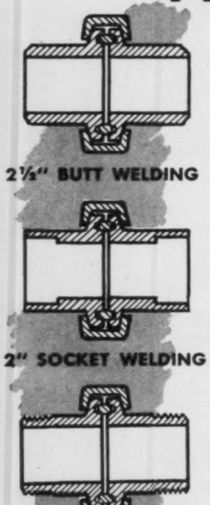
Company..

City..................................Zone......State..........

WATSON-STILLMAN



Takes the EFFORT out of PIPING INSTALLATION



Here's a pipe connection that really simplifies piping fabrication and installation. It's easy to assemble...and just as easy to take apart, yet it provides a strong, tight joint. Ideal for those hard-to-reach locations. The clamp can be rotated so the nuts are in the most convenient position for gripping and turning with a wrench. And only one wrench is needed for tightening because the heads of the carriage bolts are self-locking.

W-S Clamp-Ring Unions are available for butt-welding, socket-welding and screw-end pipe. Try them in your piping system. See for yourself how convenient...and effective...they are.

For more information on Watson-Stillman Clamp-Ring Unions and for available sizes and specifications, send today for Bulletin CRU-1.

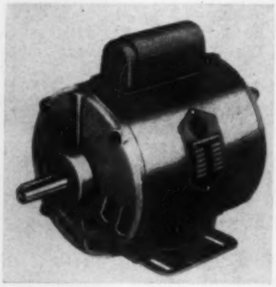
Sold Through Leading Distributors

W-S

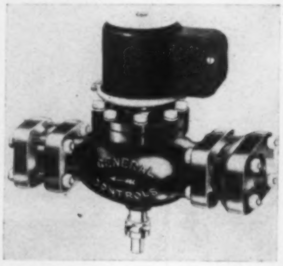
WATSON-STILLMAN FITTINGS DIVISION

HKP **H. K. PORTER COMPANY, INC.**
Roselle, New Jersey

12

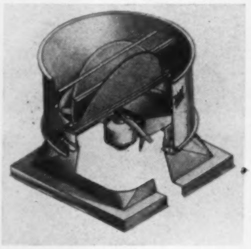


stator slots; ventilating design for air flow over windings; centrifugal starting switch.



Solenoid Valve . . .

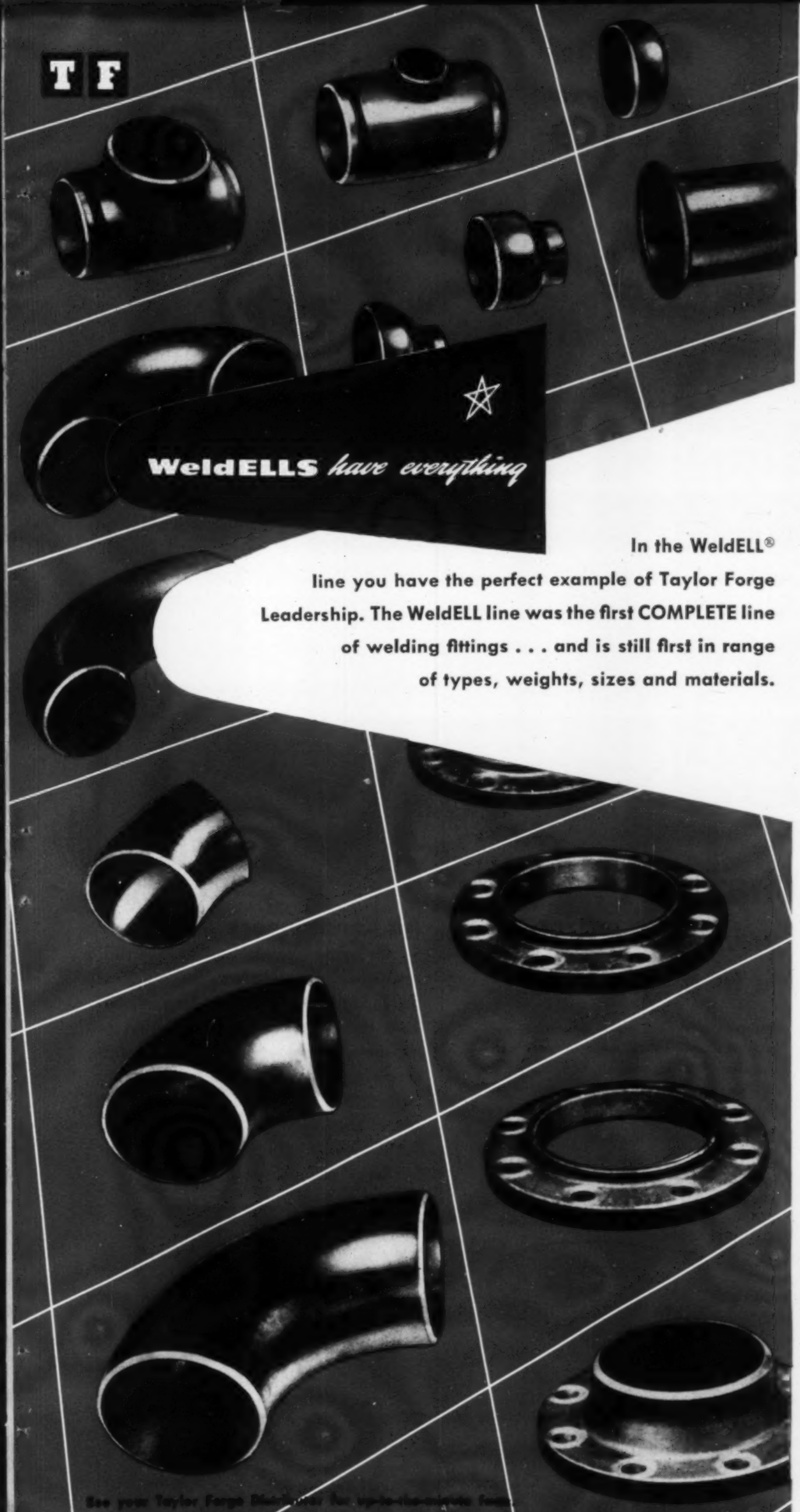
. . .with flange type magnetic piloted piston action for refrigerant control—General Controls Co., 801 Allen Ave., Glendale 1, Calif. "K-15F" series is said to handle large capacities with minimum pressure drop. Four sizes ranging from 150 to 250 psi. Flanges permit installation in 1 to 2 in. pipe size or welds, $1\frac{3}{8}$ to $2\frac{5}{8}$ in. OD tube sweat fit.



Fans, Roof Ventilators . . .

. . .feature cast iron blades, rugged design for heavy industrial uses—Francis Hill Co., 20350 Center Ridge Rd., Cleveland 16. Sizes: 18 to 60 in. diameter. Capacities: to 65,000 cfm. Also furnished in polyethylene plastic for corrosive applications.

T F



In the WeldELL® line you have the perfect example of Taylor Forge Leadership. The WeldELL line was the first COMPLETE line of welding fittings . . . and is still first in range of types, weights, sizes and materials.

GROWTH

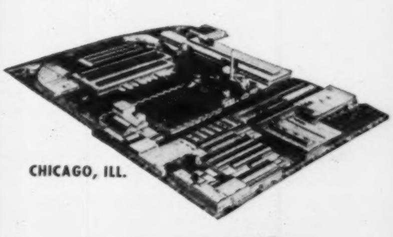
steady—sturdy—ceaseless

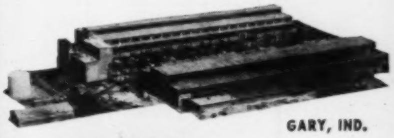
From a humble start in a 19′ x 25′ building hardly big enough to be called a plant, Taylor Forge has grown, since 1900, to encompass four substantial plants in the United States and one in Canada. This without merger or purchase of other enterprises: just steady, sturdy and continuous expansion that resulted from improvement of existing products and the development of new products.

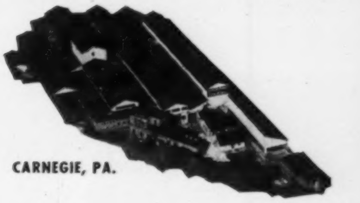
Important contributions in the field of piping—both as a transportation system and as a means for transmitting power — were made possible through constant research and investigation of those problems by Taylor Forge.

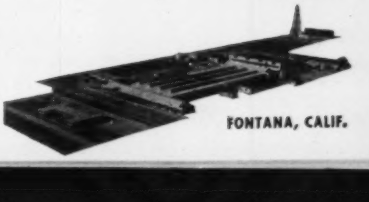
So, after all, the real factor in the growth of Taylor Forge has been a continuous growth in the knowledge of piping needs; in developing products to meet those needs; in devising facilities to make those essential products.

Many of those who, through the years, have relied upon Taylor Forge still insist on Taylor Forge products for all important piping. By the same token, year after year, many others discover that all Taylor Forge products fully justify their complete confidence.


CHICAGO, ILL.


GARY, IND.


CARNEGIE, PA.


FONTANA, CALIF.

See your Taylor Forge Distributor for up-to-the-minute facts.

TAYLOR FORGE

TAYLOR FORGE & PIPE WORKS • General Offices and Works: P.O. Box 485, Chicago 90, Illinois
Offices in all principal cities • Plants at: Carnegie, Pa.; Fontana, Calif.; Gary, Ind.; Hamilton, Ontario, Canada

KENNEDY
gives you the answers
to your Valve questions . . .

KENNEDY
Bronze Valve Check Chart
How to select the right valve for your specific job!
Gate Valves
Globe, Angle Valves
Check Valves
Seats and Discs
Bonnets
Stems
THE KENNEDY VALVE MFG. CO., ELMIRA, N.Y.
VALVES
PIPE FITTINGS
FIRE HYDRANTS

with the
New
KENNEDY
VALVE Check Charts . . .
show you at a glance *How, When, Where*
to use the correct valve to fit the job!

Now you can tell at a glance the correct KENNEDY Valve to use on a specific job . . . and why! These new valve Check-Charts show you the important features of the various types of KENNEDY Valves and explain their proper installation and use. Show you which valves go where . . . list specific Figure Numbers for accurate selection . . . describe why that valve should be used . . . and even suggest additional uses for Kennedy Valves.

One chart describes Kennedy Bronze Valves and its companion chart lists uses and conditions for Iron-Body Valves.

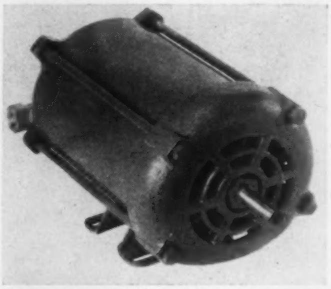
Designed for fast, easy reference, contains the answers to most of your valve questions. Large enough (16½" wide x 25" deep) for easy reading and hangs right on your wall in your office or shop.

Here are long-needed valve Check-Charts that give you quick, correct information and show you how and why certain valves are built for specific jobs. Get your Kennedy Valve Check-Charts today!

• GET YOUR KENNEDY VALVE Check Charts NOW! . . . ask your nearest KENNEDY Distributor or WRITE direct.

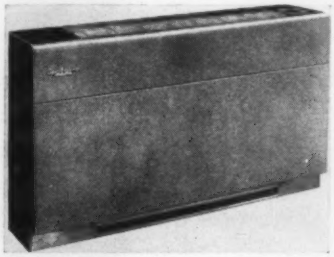
THE
KENNEDY VALVE MFG. CO.
1021 E. WATER ST.
ELMIRA, NEW YORK
• VALVES • PIPE FITTINGS • FIRE HYDRANTS
OFFICE-WAREHOUSES IN NEW YORK, CHICAGO, SAN FRANCISCO • SALES REPRESENTATIVES IN PRINCIPAL CITIES

EQUIPMENT DEVELOPMENTS
Continued



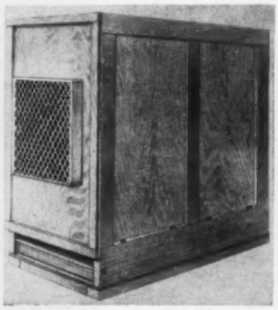
Fractional HP Motor . . .

. . . for hazardous atmospheres—General Electric Co., Schenectady 5, N.Y. For operation in dry cleaning plants, paint factories, refineries. Has cast iron end shields. Overbolt construction is said to give motor assembly added strength.



Air Conditioners . . .

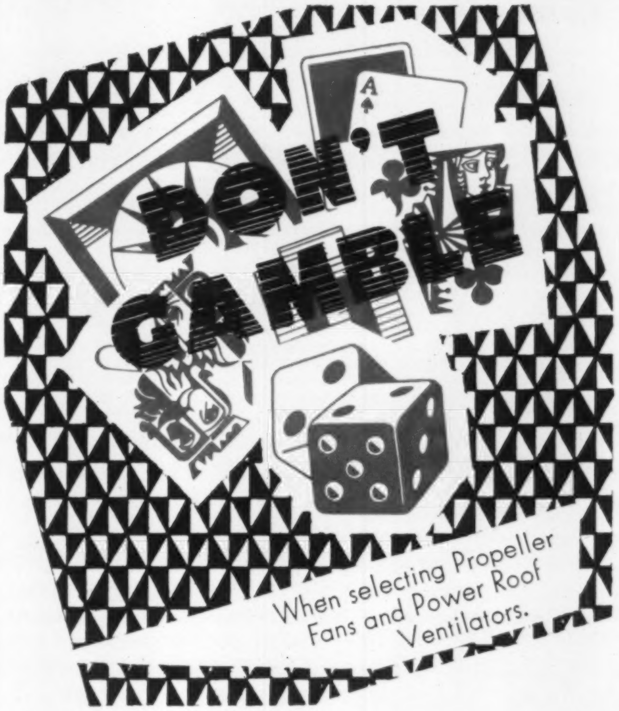
. . . for commercial, light industrial, residential use—Drayer-Hanson, Inc., 3301 Medford St., Los Angeles 63. Two styles: concealed installation in cabinets, closets; console for semi-recessing in wall or free standing. Sizes: 200, 400, 600 cfm. Cited features: removable, cleanable filter; adjustable discharge grille; right- or left-hand coil connections.



Cooling Tower . . .

. . . in 2 to 15 ton ratings—Toungate & Coats, P.O. Box 241, Austin, Tex. "Hideway" features clear heart red-

The MASSACHUSETTS *Line*®

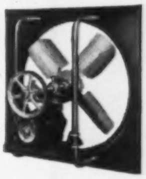

DON'T GAMBLE
When selecting Propeller Fans and Power Roof Ventilators.

OUR 76TH YEAR

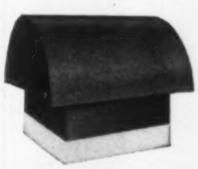
● MASSACHUSETTS ●

Propeller Fans and Power Roof Ventilators are studded with well engineered features and modern developments.

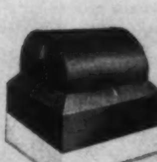
They meet the requirements of the extreme performances demanded from this type unit.



Power Roof Ventilators . . . Propeller Fan Type . . With venturi type inlet orifice. Direct drive 12 to 30 inch wheel dia. . . Belt drive 24 to 48 inch wheel dia. . . Bulletin No. 119 for complete capacity ratings and dimensions.



Propeller Fans . . .
With Venturi Type
Steel Panel . . .
Belt Drive 24 to 48
inch wheel dia. . .
Direct Drive 12 to 30 inch
wheel dia. . . A complete line of accessory items are available, Fan Houses, Shutters, etc.
Bulletin No. 117

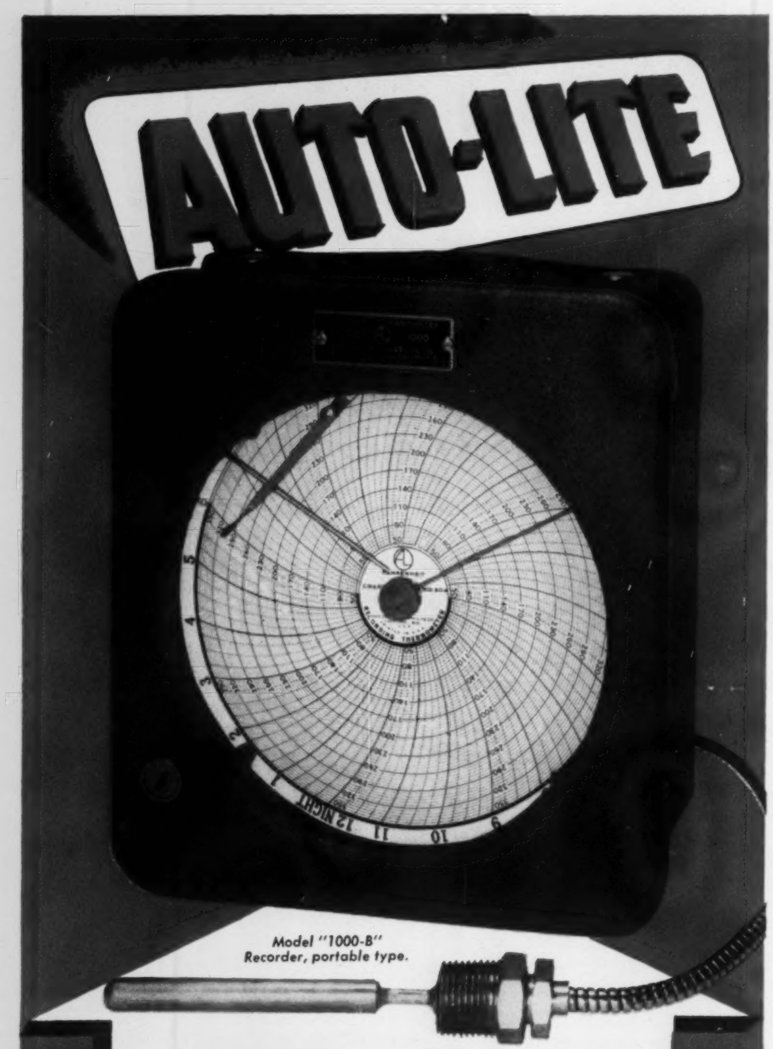


Power Fixed (backward curve blade) Type . . . Direct Drive 13 to 18 inch wheel dia. . . Belt Drive 15 to 60 inch wheel dia. . . Features include curved inlet, rugged construction, low noise level, adaptable to standard size shutters. Bulletin No. 124

MASSACHUSETTS BLOWER DIVISION

The BISHOP & BABCOCK Mfg. Co.

4901 HAMILTON AVENUE CLEVELAND 14, OHIO



AUTO-LITE

Model "1000-B" Recorder, portable type.

TEMPERATURE RECORDING...

Newly designed, Model "1000" Auto-Lite Recorder gives permanent proof of temperature behavior. • 6" clear reading chart; various standard ranges from minus 40°F. to plus 550°F. • 3 standard Recorder types for wall mounting or portable use; choice of 24-hr. or 7-day cycle. • Electric or mechanical chart drive. • Cycle indicator for refrigeration applications shows on and off time of compressor motor. • With capillary tubing for remote reading. Priced from $49.50.

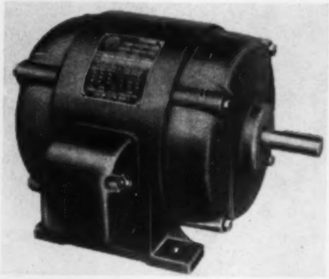
Send for new catalog describing many styles of Auto-Lite temperature Recorders and Indicators.

THE ELECTRIC AUTO-LITE COMPANY
INSTRUMENT AND GAUGE DIVISION
TOLEDO 1, OHIO
NEW YORK • CHICAGO • SARNIA, ONTARIO

EQUIPMENT DEVELOPMENTS

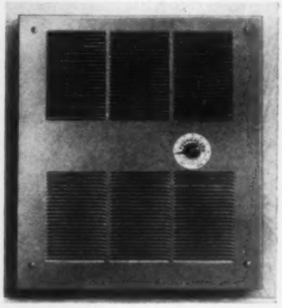
Continued

wood construction. Distributing pan and deck held by galvanized bolts. Has 220 volt single phase motor, stamped aluminum fan blades. Water distribution by gravity flow. Shipped assembled with fittings, flow valve.



A-C Electric Motors . . .

. . . for industrial use—Lima Electric Motor Co., Lima, Ohio. Feature lower air opening in end bell combined with steel baffle plate to protect winding from moisture, abrasives; double end ventilation provided by dual aluminum fans, says company. In 182, 184, 213, 215 NEMA frame sizes. Capacities to 30 hp.

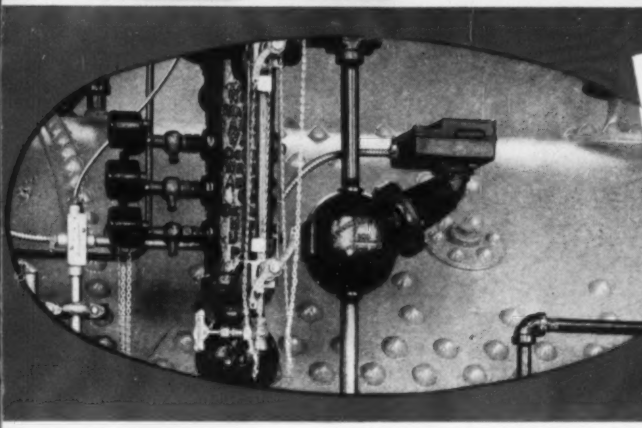


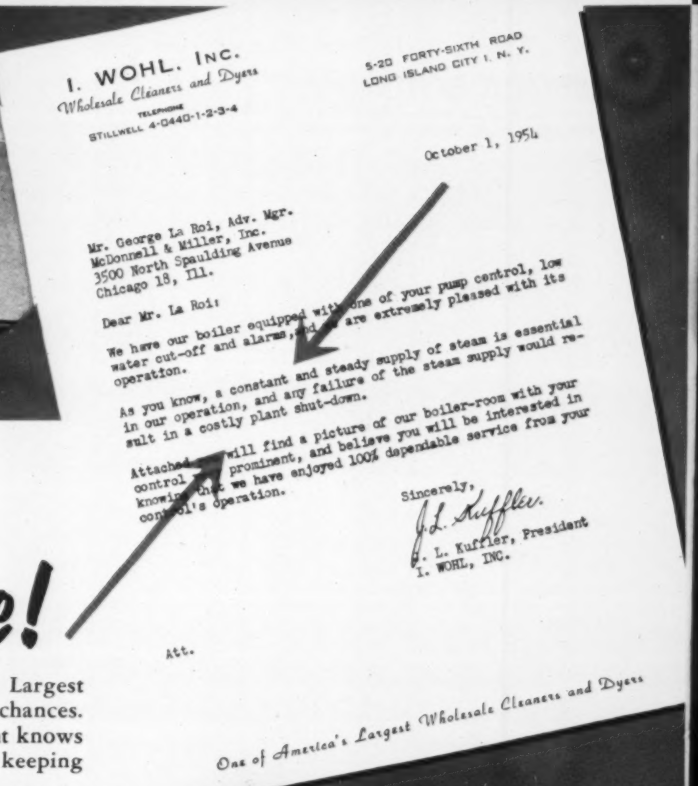
Conditioning System . . .

. . . with forced water for heating and cooling—Westcott-Alexander, Inc., Madison, N.J. For offices, stores, hotels, factories, homes, etc. Cited features: independent operation manual unit speed control; installation vertical, flush to wall; concealed piping; individual room air filters.

Heater Control . . .

. . . for gas equipment—A-P Controls Corp., 2450 N. 32nd St., Milwaukee 45. Model "55 Gasapack" comprises





I. WOHL. INC.
Wholesale Cleaners and Dyers
TELEPHONE
STILLWELL 4-0440-1-2-3-4

5-20 FORTY-SIXTH ROAD
LONG ISLAND CITY I. N. Y.

October 1, 1954

Mr. George La Roi, Adv. Mgr.
McDonnell & Miller, Inc.
3500 North Spaulding Avenue
Chicago 18, Ill.

Dear Mr. La Roi:

We have our boiler equipped with one of your pump control, low water cut-off and alarms, and we are extremely pleased with its operation.

As you know, a constant and steady supply of steam is essential in our operation, and any failure of the steam supply would result in a costly plant shut-down.

Attached [illegible] will find a picture of our boiler-room with your control [illegible] prominent, and believe you will be interested in knowing that we have enjoyed 100% dependable service from your control's operation.

Sincerely,
J. L. Kuffler.
J. L. Kuffler, President
I. WOHL, INC.

Att.

One of America's Largest Wholesale Cleaners and Dyers

No paralyzing shut-downs here!

I. Wohl, Inc. didn't grow to be "One of America's Largest Wholesale Cleaners and Dyers" by taking unnecessary chances. Their letter to us tells the story. The Wohl management knows that an unfailing steam supply is the first essential of keeping operations under way.

You know it too . . . but what you may not realize is how unexpectedly a boiler shut down can occur when the water level is not controlled by modern equipment. Thousands of plants, like I. Wohl, Inc., have found McDonnell Boiler Water Level Control the most economical and dependable way to keep the boiler going. Read the facts; then ask for simple installation instructions that will show you how easy it is to end the shut-down shudders.

McDONNELL & MILLER, INC., 3500 N. SPAULDING AVE., CHICAGO 18, ILL.

Doing One Thing Well

✓ What could be simpler?

The accompanying diagram shows the simple hook-up of the widely used McDonnell No. 150 Pump Control and No. 27 Make-up Water Feeder for boilers like yours (up to 150 psi.). The No. 150 starts and stops the pump as the water rises and falls, to hold the level within close limits. The No. 27 is installed on the receiver to supply make-up water—assure an ample level of water in the receiver at all times. A second switch is provided on the No. 150 for cutting off burner and sounding low water alarm in the event of an emergency such as current interruption in the pump circuit or failure of water supply.

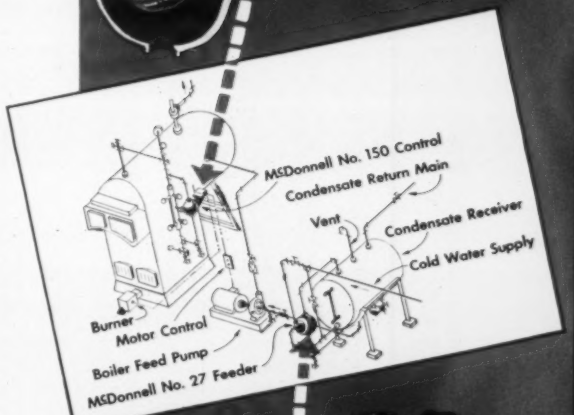
By holding the water level within close limits, the McDonnell hook-up achieves steaming efficiency and fuel economy that would make it a profitable investment even if there never were a threat of low water!

✓—or more dependable?

Ability to stand up under the pressure and temperature of laundry and cleaning plant operation is attested by the success of hundreds of McDonnell installations. The No. 150 is approved by Underwriters' Laboratories, Inc. Switch leads have heat-impervious, porcelain-bead insulation. Packless construction is provided by extra-heavy monel bellows. Float has extra-heavy shell. Entire mechanism is sealed to prevent tampering.

The No. 27 is equally rugged and dependable. It has large water feeding capacity; bronze and stainless steel valve mechanism. Every detail of construction speaks quality. Other make-up feeders are available to meet almost all conditions.

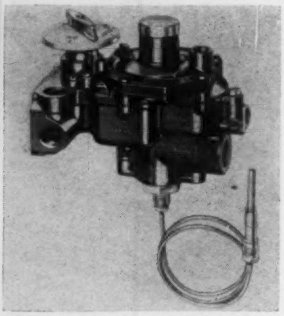
No. 150
PUMP CONTROL



No. 27
MAKE-UP FEEDER

Your Jobber Stocks Them

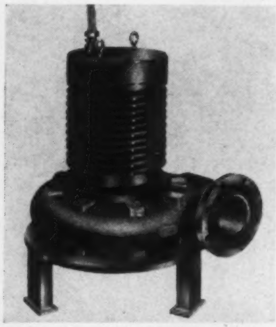
McDONNELL *Boiler Water Level Controls*



five controls: built in pressure regulator for city gas, large pilot filter, automatic pilot, main and pilot shutoffs. Accessories include "55 MTS" modulating snap thermostat, "55 MT" modulating thermostat, "55 ET" electric thermostat.

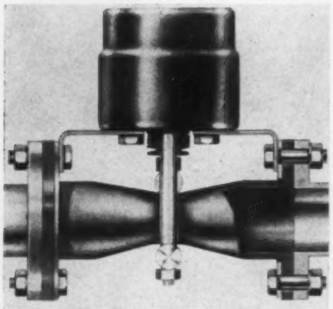
Drainage Pump . . .

. . .for problems caused by flash floods—Weil Pump Co., 1523 N. Fremont St., Chicago 22. Heavy duty screenless type with "non-clog" impeller. Designed for submerged operation. Motor, bearings hermetically sealed. Discharges 4 to 6 in., capacities 400 to 2000 gpm.



Flanged Valves . . .

. . .for handling corrosives, wet or dry abrasive slurries—R.K.L. Valve & Mfg. Co., 1623 Elaine St., Philadelphia 19. Is straight through pinch type. Consists of flanged rubber body and self supported air operated pinching mechanism. With positioner for control, without for *on-off* service. Sizes: ¼ to 14 in. for maximum 100 psi line pressure, 180 F.



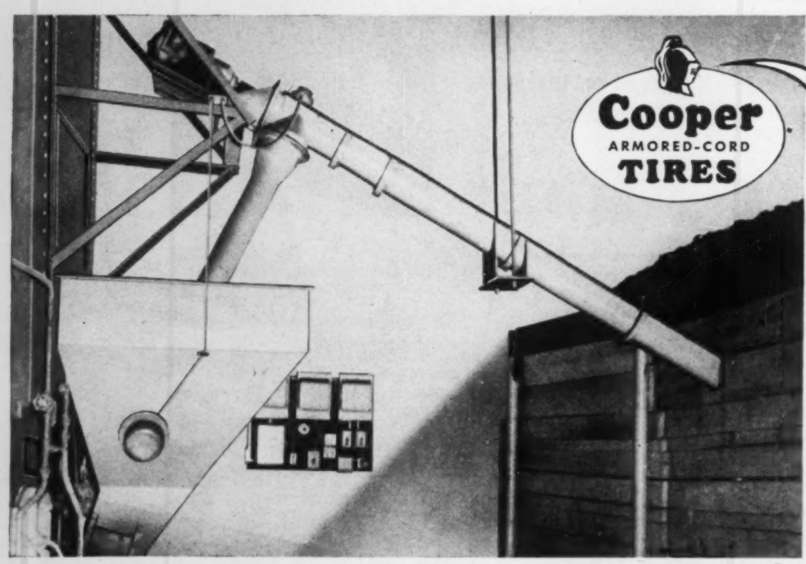
Flanged Valve

Equipment Briefs . . .

DAMPER HARDWARE KIT is said to eliminate binding, reduce assembly time—Duro-Dyne Corp., 800 Third Ave., New Hyde Park, N.Y. Connecting rod doesn't interfere with full blade opening. Full closing without bracket hitting duct. Pivot, set screw preassembled onto bracket.

WELDER uses 6 volts, requires no glasses—Cauhorn Mfg. Co., 9999 Broadstreet, Detroit 4. Operates on 115 volt, 60 cycles.

SWITCHING TO AUTOMATIC COAL HANDLING, COOPER TIRE AND RUBBER



"TAKES IT UP A FLO-TUBE"

. . . We are very pleased with the FLO-TUBE operation. To date we have put some 10,000 tons of coal through it without maintenance.
Very truly yours,
COOPER TIRE & RUBBER COMPANY
Mil McKinley, Chief Engineer

This shows how easily CANTON'S FLO-TUBE can be adapted to existing coal fired equipment. Available in Heavy Cast Iron U-Trough design for permanence, or Steel U-Trough or Round Pipe types for economy. Direct Drive through Geared Motor reduces H.P. required and operating costs—also assures dependability and low upkeep. Also can be had in completely dustproof "package-unit" type combined with Canton Ramfeed and Screwfeed Stokers.

Exposed end placed in Coal Bin picks up coal and fills Hoppers automatically. Can be applied on incline or horizontally to feed one or a series of Hoppers. Bin Level Controls keep Hoppers filled to desired height at all times. Alarms or Lights can be applied to signal fuel supply failure. U-Trough design permits instant accessibility to all parts.

WRITE FOR THIS BROCHURE
flotubes

CANTON STOKER CORPORATION
SPECIALISTS IN AUTOMATIC COAL FIRING, HANDLING AND CONTROL EQUIPMENT

CANTON STOKERS

CANTON STOKER REPRESENTATIVES IN ALL PRINCIPAL CITIES WILL BE HAPPY TO GIVE YOU COMPLETE INFORMATION AND PRICES . . . OR WRITE DIRECT

2400 Andrew Place S. W.
CANTON, OHIO

EQUIPMENT DEVELOPMENTS

Continued

ACETYLENE TORCH with fast cooling heads for quick changing—Ransome Co., 4030 Hollis St., Emeryville, Calif. Outfit includes two handle assemblies, seven head styles. Bunsen burner available with kit.

ROOM AIR CONDITIONER in 2 hp, flush mounted model—Mitchell Mfg. Co., 2525 N. Clybourn Ave., Chicago. For 1000 to 1300 sq ft areas. Same size as units with smaller ratings. Is said to be highest capacity window unit made.

YELLOW COVERED HOSE for visibility during underground water service—Boston Woven Hose & Rubber Co., 29 Hampshire St., Cambridge, Mass. Is said to remove hazard to workmen, reduce accidental damage to pipe. In ¾, 1 in. ID.

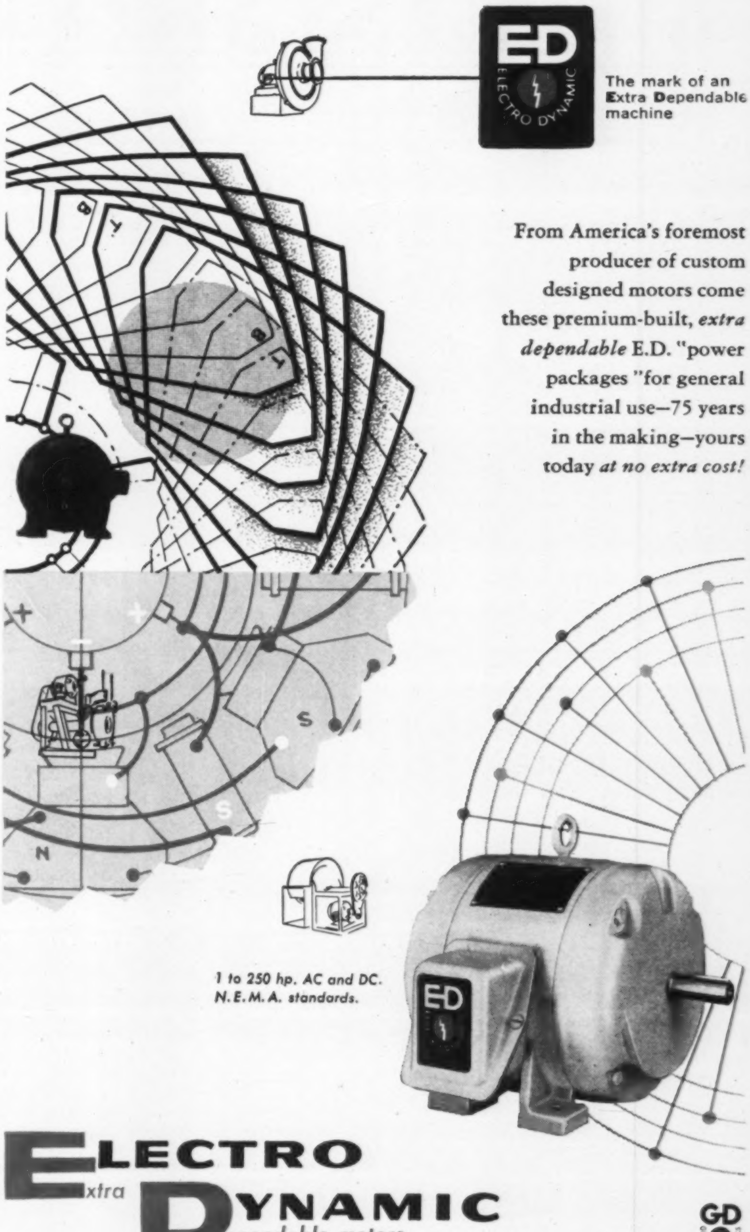
ANTI-RUST PAINT for industrial, commercial use—Corro-Vent, Inc., 510 Mercantile Library Bldg., 414 Walnut St., Cincinnati. Thermoplastic, resin base. Quick drying.

COPPER WATER TUBE in round carton packaging for flat rolls—Wolverine Tube, Div. of Calumet & Hecla, Inc., 1852 Guardian Bldg., Detroit 26. Designed as storage space saver; reel for installation serviceman.

PORTABLE ROOM COOLER to be plugged into any electrical outlet—Utility Appliance Corp., 4851 S. Alameda St., Los Angeles 58. Has built in water pump, 12 in. fan turned by two speed motor. Weighs 27 lb.

RUBBER CAPS, PLUGS to protect tubing ends, threaded fittings—Ray A. Scharer & Co., 3000 E. Grand Blvd., Detroit 2. Are said to prevent moisture, dirt penetration; seal in gases, liquids; mask pipe ends from paint spray, preservative finishes. Sizes: caps for tubing, ⅛ to 1½ in. OD; plugs, 3/16 to 1 5/8 in. ID.

a better kind of power
FOR INDUSTRIAL MACHINES



The mark of an **E**xtra **D**ependable machine

From America's foremost producer of custom designed motors come these premium-built, *extra dependable* E.D. "power packages" for general industrial use—75 years in the making—yours today *at no extra cost!*

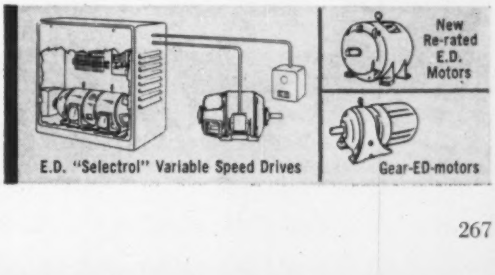
1 to 250 hp. AC and DC. N.E.M.A. standards.

ELECTRO Extra DYNAMIC Dependable motors

PRODUCT OF GENERAL DYNAMICS

NEW...
Write for Brochure 100 and literature on new E.D. motors and drives.

Electro Dynamic division of General Dynamics Corporation
Bayonne, New Jersey

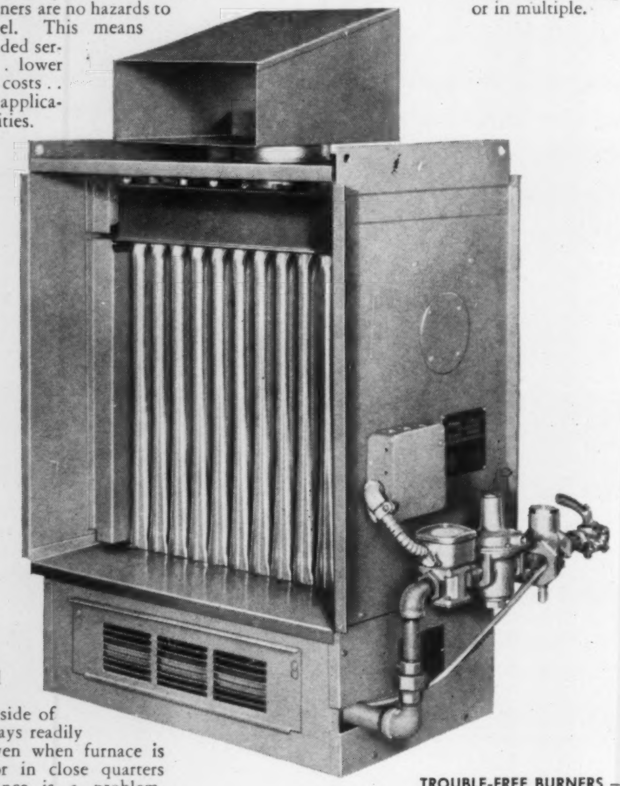


NOW--Modine STAINLESS STEEL

Gas-Fired Duct Furnaces

POSITIVE RUST PROTECTION — Here's a new lightweight gas-fired duct furnace with rust- and corrosion-resistant stainless steel heat exchanger and burner. It's specially built for use with cooling coils or packaged air conditioners. Cool, moisture-laden air and condensation which rust ordinary steel tubes and cast iron burners are no hazards to stainless steel. This means greatly extended service life . . . lower maintenance costs . . and wider application possibilities.

EASIER INSTALLATION — Modine Duct Furnaces are light in weight, easier and less expensive to handle and install. Only the heat exchanger area, not the entire unit, is enclosed in duct work. Furnaces may be used singly or in multiple.



CONTROLS ALWAYS ACCESSIBLE
Entire control assembly is mounted on side of unit . . . always readily accessible, even when furnace is near floor or in close quarters where clearance is a problem.

DIRECT-FIRED HEAT EXCHANGER — Stainless steel tubes are seam-welded into a rigid, gas-tight heat exchanger. Each tube is individually-fired for most effective and uniform heat transfer.

TROUBLE-FREE BURNERS — Stainless steel burners have self-cleaning ports with four times the free area of conventional drilled ports. Sharp edges deter lodging of dirt or scale. Complete burner and manifold assembly are easily removed.

FIVE SIZES—88,000 to 213,000 Btu/hr input. Many applications—in air conditioning systems . . . as a concentrated source of heat for central heating systems . . . as "boosters" to supplement a central plant . . . for industrial and agricultural drying, processing and ventilating.

Modine
GAS-FIRED DUCT FURNACES

For new Bulletin 855, contact the Modine representative listed in your classified phone book, or write to Modine Mfg. Co. 1509 DeKoven Ave., Racine, Wis.

Modine GAS-FIRED STAINLESS STEEL DUCT FURNACES

D-1260

EQUIPMENT DEVELOPMENTS

Continued

SPACE HEATER to heat buildings under construction, garages, sheds, etc.—Vapor Heating Corp., 6420 W. Howard St., Chicago 31. Heats and circulates 2500 cfm of air. Has home type oil burner. May be equipped with natural or bottled gas burner. Fuel nozzles can be changed for 80,000 to 200,000 Btu input.

REMOTE SYSTEM for transmission of flow, other measurable data over distances—Simplex Valve & Meter Co., 7 E. Orange St., Lancaster, Pa. Uses two wire circuit. For transmission of flow, liquid level, pressure measurement. May be applied to mercury cylinders for measurement of 4-1 to 20-1 ratios.

HOT SPRAY VINYL for corrosion control—Prufcoat Laboratories, Inc., 50 E. 42nd St., New York 17. Single spray pass provides 4 mil coat. For use with company's metal primer.

CHEMICAL-RESISTANT coatings, linings for plant maintenance—Corrosion Control Co., Inc., 516 Fifth Ave., New York 36. Neoprene based. In 1, 5, 55 gal quantities.

FLEXIBLE PLASTIC PIPE coiled on disposable reel package combination—Triangle Conduit & Cable Co., Inc., New Brunswick, N.J. Cited features: Longer lengths; can be pulled off reel quickly, easily; reels stack compactly.

PORTABLE SKYHOOK hoist support for lifting, shifting, lowering—B. E. Wallace Products Co., Exton, Pa. Supports 2000 lb. Weighs 22 lb. Can be closed to 5 ft $4\frac{1}{2}$ in. for storage.

$1\frac{1}{2}$ *HP AIR CONDITIONER* included in company's line of 24 window models for 1955—York Corp., York, Pa. Cited features: thermostat control, comfort director grilles, easy

EQUIPMENT DEVELOPMENTS

Continued

filter removal. Line available in eight different styles.

REDUCING VALVES for water pressure control—Klipfel Valves, Inc., Hamilton, Ohio. Sizes ½ to 4 in., for initial pressures to 300 psi, delivery pressures 10 to 75 psi. Spring diaphragm type construction.

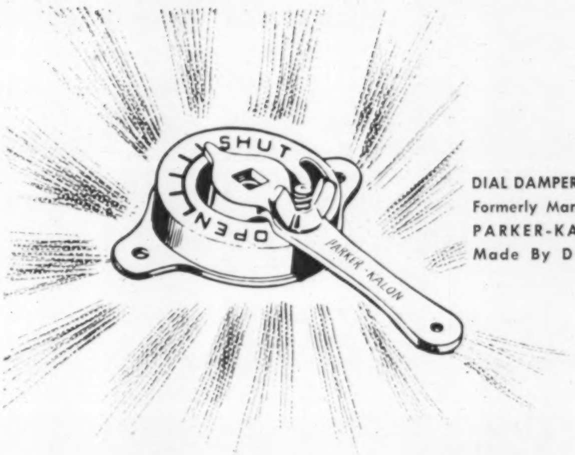
TEMPERATURE ACTUATED SAFETY REGULATORS for controlling vapor lines in degreasers—Farris Stacon Corp., Palisades Park, N.J. Shuts off flow of steam, gas to heating coil if vapor exceeds given level. Sizes ½ to 1 ½ in. Controls temperatures 25 to 325 F. Inlet pressure limit 100 psig.

MOISTURE CONTROL SYSTEM for refrigeration equipment—Ansul Chemical Co., Marinette, Wis. Indicates when moisture is present, removes it. Leakproof window has indicating element which changes color showing moisture content of refrigerant.

INHERENT OVERHEAT MOTOR PROTECTOR for 3 phase, Y-connected motors, single and dual voltage through 600 volts—Spencer Thermostat Div. of Metal & Controls Corp., Attleboro, Mass. Consists of molded phenolic base assembly with three heaters, thermal disc with three contacts. Four sizes for fractional to 7½ hp.

PLASTIC CORK COVERING for cold water pipe—J. W. Mortell Co., Kankakee, Ill. Is said to stop condensation drip permanently. Self adhering.

ELECTRIC THERMOMETER with pushbutton operation—Victory Engineering Corp., Union, N.J. For operations where frequent temperature checks necessary in air conditioning, heating. Consists of meter, two ex-



DIAL DAMPER REGULATOR
Formerly Manufactured By
PARKER-KALON Now
Made By **DURO-DYNE.**

THANK YOU...

We're in full production on the famous Dial Damper Regulators, plus the many other former Parker-Kalon products for the Heating, Air Conditioning and Metal Working industries.

Thanks to you, our customers and distributors, orders have been heavy since the day Duro-Dyne took over the manufacture and sale of these items. You found that Duro-Dyne produces in the fine Parker-Kalon tradition of quality, dependability and performance.

Preassembled Duro-Metal-Fab is another outstanding Duro-Dyne product. With Duro-Metal-Fab, flexible duct connectors (for eliminating vibration travel) can be made three times faster. Metal comes already attached to U.L. Approved Canvas, closely woven Asbestos or Neoprened Fiberglas Fabric. No time or material is wasted attaching metal to fabric, thereby slashing flexible duct connector costs. With Duro-Dyne's exclusive Double-Loc seam, the metal will not separate from, or cut the fabric when installed. This eliminates callbacks.

Complete catalog fully describes Duro-Metal-Fab and Dial Regulators, as well as the extensive line of other Duro-Dyne products—including those formerly manufactured by Parker-Kalon. Products are available at your P-K—Duro-Dyne distributor.

DURO
METAL-FAB
FLEXIBLE
DUCT CONNECTOR

DURO-METAL-FAB
Flexible Duct Connector Material.

DURO-DYNE *Corporation*

800-D Third Ave.,
New Hyde Park,
New York

COOLING WITH STEAM

C. H. WHEELER STEAM JET EJECTORS

In most cases if a process steam system is large enough for heating in winter, it can be used economically to provide air conditioning in the summer, because the increased steam load costs less per pound than the part load for process alone. A C. H. Wheeler Steam Jet Ejector system becomes most economical when air conditioning requirements exceed 100 tons. By means of this system water is chilled to as low as 50-55°F. with steam pressure of 50 psi or over. C. H. Wheeler has always led in the development of the steam jet ejector and its application to industrial refrigerating requirements. We invite your correspondence.
(Catalog 1462 is available.)

Note: In many areas utilities offer an attractive street steam rate in summer, which makes the steam jet ejector system economical for air conditioning large commercial and public buildings.

WE-509

C.H. Wheeler
of Philadelphia
19TH AND LEHIGH AVE., PHILADELPHIA 32, PA.

tension tubes, one air temperature sensing probe.

INSULATION FASTENER designed to speed, simplify application to ductwork—Huck Mfg. Co., 2480 Bellevue Ave., Detroit 7. Hand tool used to drive "9SP Huckpins" into insulation to 2 in. thickness.

VENTED GAS HEATER for large area heating—Perfection Industries, Inc., 7609 Platt Ave., Cleveland 4. 100,000 Btu output. Requires only flue, gas supply, 110 volt line connections. Operates on natural, manufactured or LP gas.

CONTROL SYSTEM permits remote control of pumps, valves, circuit breakers, etc. from central dispatching station—Builders-Providence, Inc., 345 Harris Ave., Providence. Uses pair of signal wires, supervised by operator. Two way transmission of multiple telemetering.

VOLTAGE BOOSTERS designed to eliminate low line voltage for air conditioners—Control Systems, Inc., P.O. Box 115, Brooklyn 14. In fixed output and automatic controller models. For a-c motors.

SPRAYED FOAM INSULATION for speed in insulating irregular surfaces—Insul-Mastic Corp. of America, 1141 Oliver Bldg., Pittsburgh. Sprays on like paint, foams to twenty times thickness. Has k factor of 24 per inch thickness. For temperatures to 225 F.

BUILT-IN ROOM AIR CONDITIONERS for builders of apartment houses, hotels, office buildings, etc.—Tywel Mfg. Cor., 5702 First Ave., Brooklyn 19. Design eliminates overhang inside room, outside wall.

●

What's your
GATE VALVE
MORTALITY

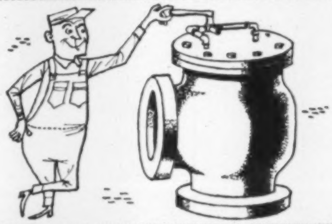
on installations requiring frequent opening and closing?

REPLACE *them*
with G-A
FLOWTROL
VALVES

✓ *Use the Angle Body and Save the Price of an Elbow Fitting*

✓ *Built to Last a Lifetime*

✓ *Operates with Finger Pressure*



HERE'S PROOF:
One of America's large railroads had a 6″ gate valve installation that operated on the average of 55 times a day. In addition to frequent repairs, this valve had to be entirely replaced every 3 months.

In the Fall of 1947, this valve was replaced with a 6″ G-A Flowtrol Valve. Now—more than 7 years later—this valve is still operating perfectly and not one parts replacement has been made!

Want to know more about this unique valve? Write for Bulletin W-8A today.

GOLDEN ANDERSON
Valve Specialty Company
1210 RIDGE AVE., PITTSBURGH 33, PA.
Designers and Manufacturers of
VALVES FOR AUTOMATION

RECENT TRADE LITERATURE...

▶ *AIR CONDITIONING*—New 4 page folder illustrates, gives specifications for company's line of air conditioning units. Clime-matic Corp., 230 Park Ave., New York 17.

▶ *AIR CONDITIONING BUILDINGS*—Tips on application of air conditioning to various types of buildings contained in *Guideposts to Better Air Conditioning Installations*, new 36 page booklet. E. I. du Pont de Nemours & Co., Wilmington 98, Del.

▶ *AIR CONDITIONING, HEATING*—*This Is usAIRco* is a 12 page booklet describing the company's history and manufacturing facilities and containing details of its line of heating, ventilating and air conditioning products for commercial and industrial use. United States Air Conditioning Corp., 3300 Como Ave., S.E., Minneapolis 14.

▶ *AIR CONDITIONING JOB DATA SHEETS*—Booklet contains pad of job data sheets for recording information on operation of company's "Ice-Cel" air conditioning system. Dole Refrigerating Co., 5910 N. Pulaski Rd., Chicago 30.

▶ *AIR CONTROL VALVES*—Company's 2-, 3-, 4-way air control valves for high, low pressures displayed in new 66 page catalog. Contain following type valves: cam, flow control, foot, hand, interlocking, pilot, pressure, regulator, solenoid, time delay, etc. Airmatic Valve, Inc., 7317 Associate Ave., Cleveland 9.

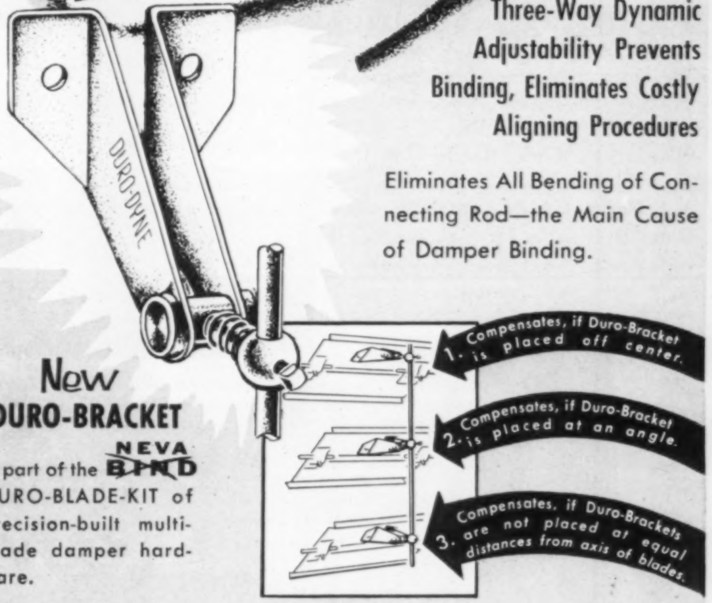
▶ *AIR DIFFUSERS*—New 64 page selection manual contains illustrations showing installation, design, use of aspirating air diffusers, accessories. Anemostat Corp. of America, 10 E. 39th St., New York 16.

LOUVER DAMPERS WON'T BIND with the *Sensational NEW* NEVA ~~BIND~~™ DURO BLADE KIT

Pat. Pend.

Three-Way Dynamic Adjustability Prevents Binding, Eliminates Costly Aligning Procedures

Eliminates All Bending of Connecting Rod—the Main Cause of Damper Binding.


DURO-DYNE
1. Compensates, if Duro-Bracket is placed off center.
2. Compensates, if Duro-Bracket is placed at an angle.
3. Compensates, if Duro-Brackets are not placed at equal distances from axis of blades.

New DURO-BRACKET

A part of the NEVA ~~BIND~~ DURO-BLADE-KIT of precision-built multi-blade damper hardware.

VALUABLE FEATURES NOT FOUND IN OLD STYLE BRACKETS

- Absolutely non-binding action. New DURO-BRACKET assures perfect blade action even though brackets are placed *off-center*, placed *at an angle*, or *not placed equally distant from axis of blades!*
- New DURO-BRACKET need not extend beyond edge of its blade! It allows for full opening and closing of blades without brackets hitting duct. Connecting rod will not interfere with full blade opening.
- Pivot and set screw are pre-assembled onto new DURO-BRACKET for you. No loose parts to assemble.

Sold by leading jobbers throughout the U.S.A. and CANADA.

DURO-DYNE *Corporation*

800-D Third Ave., New Hyde Park, New York

RECENT TRADE LITERATURE

Continued

▶ *ASH HANDLING SYSTEM*—Data sheet Za covers application of "A-S-H" steam jet pneumatic ash handling systems to small steam boiler plants. Allen-Sherman-Hoff Co., 259 E. Lancaster Ave., Wynnewood, Pa.

▶ *BOILERS*—New 8 page brochure describes company's "S" series boilers. Contains data, specifications for models with ranges from 10,800 to 50,000 lb per hr of steam. Wm. Bros Boiler & Mfg. Co., 1057 10th St., S.E, Minneapolis 14.

▶ *BOILERS*—News tabloid presents "CB" models of self contained boilers. Illustrations include installations, demonstrations, cutaway view of boiler, plant facilities. Cleaver-Brooks Co., Milwaukee 12.

▶ *BOILERS*—Bulletin No. C-1100-B63 covers manufacturer's "AO" and "BA" cast iron gas fired boilers for hot water, steam heating and hot water supply. Specification tables for operation with radiation, hot water and steam radiation included for each type. Worthington Corp., Harrison, N. J.

▶ *BOILER VALVES*—Blowoff valves, drain valves, water level gages for high pressure boilers discussed in new 4 page folder. Yarnall-Waring Co., 100 Mermaid Ave., Philadelphia 18.

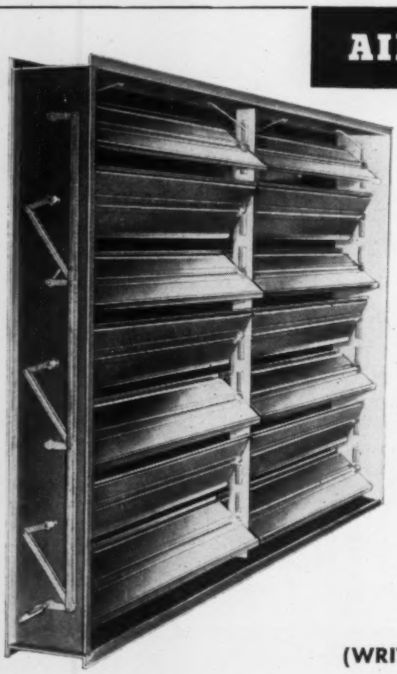
▶ *BRAZING*—New 24 page brazing manual, catalog 925, deals with application of major brazing methods in joining metals using silver alloys and filler metals, fluxes, gas atmospheres. Air Reduction Co., Inc., 60 E. 42nd St., New York 17.

▶ *CARBON MONOXIDE DETECTOR*—Data sheet No. 10.15-13 describes Taller and Cooper carbon monoxide detector, its uses with "ElectroniK" potentiometer. Minneapolis-Honeywell Regulator Co., Industrial Div., Wayne and Windrim Sts., Philadelphia.

▶ *CARBON STEEL TUBING*—New 12 page brochure discusses manufacturer's "Electrunite" carbon steel tubing for heat exchangers, condensers. Republic Steel Corp., Steel and Tubes Div., 224 E. 131st St., Cleveland 8.

▶ *CENTRIFUGAL COMPRESSOR MOTORS*—Application of a-c motors, controls to centrifugals covered in 12 page booklet. Discusses highlights of synchronous motor, induction motor torque requirements, gives hints for selection of motor type. Electric Machinery Mfg. Co., Minneapolis 13.

▶ *CENTRIFUGAL PUMPS*—Bulletin No. 3350 gives



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LOUVRE DAMPERS

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RECENT TRADE LITERATURE
Continued

specifications, dimensions, performance tables for new self priming "Motor Mount" centrifugal pumps for air conditioning, general industrial use. Deming Co., Salem, Ohio.

▶ *COATING FOR INSULATION*—"Lagz," protective coating for thermal insulation, presented in 6 page folder. Product is said to be unaffected by moisture, oils, brine, solvents, corrosive gases, chemicals, weathering. West Chester Chemical Co., Box 39 West Chester, Pa.

▶ *COLORS FOR PANELS, RECORDERS*—Product specification G71-2 displays latest standard color combinations for company's panels and recorders, types "KM" and "WM." Bailey Meter Co., 1050 Ivanhoe Rd., Cleveland 10.

▶ *COMPRESSED AIR*—Form 213-A, *A Better Air Power System*, discusses power losses in compressed air lines, how to bring them to accepted standards. Contains diagrams of piping networks, tables of friction losses of air in pipe, fittings, hose. Ingersoll Rand Co., 11 Broadway, New York 4.

▶ *CONDENSATION PUMPS*—Bulletin No. 1403 contains illustrations, technical data on capacities, dimensions, application, installation of manufacturer's line of condensation pumps. C. A. Dunham Co., 400 W. Madison St., Chicago 6.

▶ *CONDENSATION RETURN UNITS*—Bulletin 113-LR-A describes company's "Apco-Matic" condensation return units for heating systems rated 800 to 10,000 EDR, pressures to 80 psi. Aurora Pump Div., New York Air Brake Co., Aurora, Ill.

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FEATURE for FEATURE
THE MOST ADVANCED DESIGN
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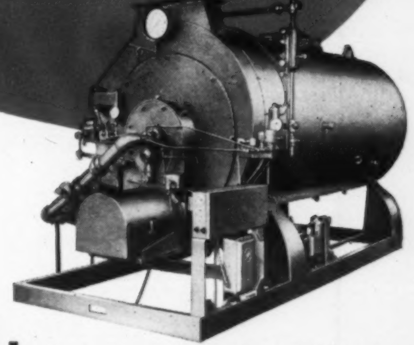

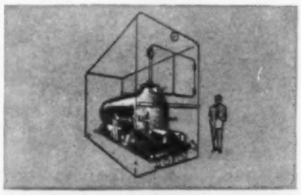

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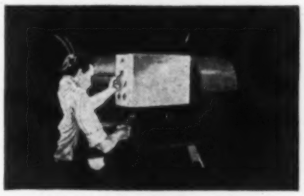
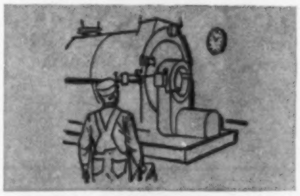


2. More Efficient Operation Reduces Fuel Costs! Cyclotherm guarantees a minimum 80% efficiency in oil and/or gas. Fuel changeover can be quickly made as fuel prices fluctuate. From cold start to full power takes only 15 to 20 minutes. Capacity can be reduced without losing peak efficiency.



3. The Finest Service Facilities In Steam Generation! *A nation-wide network* of factory-trained servicemen are available at any hour, weekdays and weekends.

4. Simplified Maintenance Saves Up To 50% In Costs! One maintenance man can clean return tubes . . . replace and clean burner nozzle. Firetube never needs cleaning.

Cyclotherm Steam and Hot Water Generators range from 18 to 500 hp . . . from 15 to 200 psi. For complete details on their many space- and cost-saving features, mail this coupon today for your free booklet.

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RECENT TRADE LITERATURE

Continued

▶ *CONTINUOUS BLOWOFF SYSTEM*—Publication 5700 discusses manufacturer's continuous blowoff system designed to maintain uniform boiler water concentration, reduce blowdown requirements Cochrane Corp., Philadelphia 32.

▶ *COOLING, HEATING CONTROL*—Bulletin 1487-AA illustrates, describes cooling controls for air conditioning, refrigeration. Contains specifications, application data, procedure for ordering. Bulletin 1508-Z covers company's heating controls. Similar information. Penn Controls, Inc., Goshen, Ind.

▶ *CORROSIONPROOF VENTILATING, EXHAUST SYSTEMS*—New 8 page brochure designed to aid in selecting, installing corrosionproof polyethylene ventilating and exhaust systems. American Agile Corp., Bedford, Ohio.

▶ *D-C MOTORS*—New 12 page illustrated bulletin describes company's "Super T" line d-c motors. Booklet explains "dynamic response" feature. Reliance Electric & Engineering Co., 1088 Ivanhoe Rd., Cleveland.

▶ *DEALKALIZER*—Process by which dealkalizer uses ion exchange principle of salt splitting to reduce alkalinity in boiler feed, process water, discussed in publication 4567. Cochrane Corp., 3131 N. 17th St., Philadelphia 32.

▶ *DRAFT CONTROLS*—New 16 page booklet is handbook of company's draft controls for industrial installations. Walker Mfg. & Sales Corp., 1711-17 Penn St., St. Joseph, Mo.

▶ *DUCTILE IRON*—New 30 page illustrated booklet includes case histories, for valves, pumps, compressers, etc., specification tables for seven types of ductile irons, charts comparing mechanical properties for each. International Nickel Co., Inc., 67 Wall St., New York 5.

▶ *ELECTRIC PLANTS*—New catalog illustrates company's line of 23 "Gen-A-Matic" electric plants. Provides portable high power for drills, saws, etc. In models to 5000 watts d-c, to 12,500 a-c. Multi-Matic Corp., Van Nuys, Calif.

▶ *ELECTRIC THERMOMETER*—Bulletin No. 1465 discusses, illustrates company's "Alnor" distant reading electric thermometer. Illinois Testing Laboratories, Inc., 420 N. LaSalle St., Chicago 10.

▶ *EVAPORATIVE CONDENSERS*—Cutaway illustration, construction details of company's new design in evaporative condensers presented in catalog No. 500. Acme Industries, Inc., Jackson, Mich.

TVC *Condensate Pumps*

LOW PRESSURE SYSTEM

LOW RETURN CONNECTION
LOW SPEED, LONG LIFE
CAST IRON RECEIVER
SINGLE OR DUPLEX

A SINGLE UNIT easily converted at any time to a DUPLEX UNIT

The Single Unit TVC Condensate Pump in a 15 gallon receiver can be converted to a DUPLEX UNIT whenever load or other conditions require. Each receiver is furnished machined and drilled for the addition of another pump and control.

Conversion to a Duplex Unit doubles the capacity of the unit, or where desired, provides a stand-by pump. Additional pump is installed right on the job. Removal of the unit is unnecessary.

Specify the "Convertible" TVC in the 15 gallon receiver when ordering low pressure system condensate pumps.

Capacities from 500 to 10,000 sq. ft. E.D.R.

Available from Jobbers' Stock

• Dimensions

15 gallon cast iron receiver for single or duplex units: diameter $25\frac{1}{2}$", height of return above floor—$7\frac{3}{16}$".
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• Features

TVC Condensate Pumps are low speed (1750 RPM) for long life, are readily installed in area where space is important. Their compact cast iron receiver and sturdy pumping unit assure a trouble free installation.

• Installation

Simple installation consists of connecting return line to receiver, and connecting discharge to boiler, using a check valve and a gate valve. Unit is completely assembled at the factory. Send for Bulletin TVC300.

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RECENT TRADE LITERATURE

Continued

▶ *EXPANSION VALVES*—Fourteen models of automatic expansion refrigeration valves with capacities ½ to 1¾ ton discussed in form E210. A-P Controls Corp., 2450 N. 32nd St., Milwaukee.

▶ *FLOAT ACTUATED METER*—Data sheet No. 10.3-4a on float actuated flow and liquid level meter describes application, design features. Minneapolis-Honeywell Regulator Co., Industrial Div., Wayne and Windrim Sts., Philadelphia 44.

▶ *GAS FIRED DUCT FURNACES*—Four page bulletin outlines uses of company's new gas fired duct furnaces for heating, ventilating, air conditioning. Dimensional, performance data covered in charts, drawings. Modine Mfg. Co., Racine, Wis.

▶ *GLASS BLOCKS*—*How to Modernize Old Windows with PC Glass Blocks* is new 8 page booklet. Illustrates how to select proper block for various window exposures. Pittsburgh Corning Corp., 1 Gateway Center, Pittsburgh 22.

▶ *HORIZONTAL CASE FOR CONTROLLERS*—Bulletin 1060 describes new 19 in. wide horizontal case for housing company's millivoltmeter controllers. Minneapolis-Honeywell Regulator Co., Industrial Div., Wayne and Windrim Sts., Philadelphia 44.

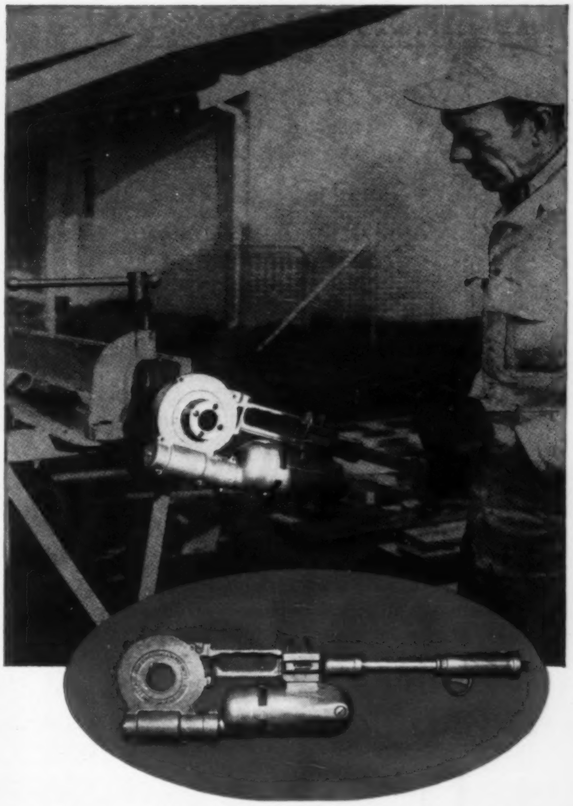
▶ *INCINERATOR BURNERS*—Bulletin H-51 contains specifications for new packaged incinerator burners with capacity range of 50,000 to 500,000 Btu per hr. Eclipse Fuel Engineering Co., 1002 Buchanan St., Rockford, Ill.

▶ *INSTRUMENTS*—Catalog 5002 is composite catalog describing company's industrial instruments, equipment, including latest developments. Minneapolis-Honeywell Regulator Co., Industrial Div., Wayne and Windrim Sts., Philadelphia 44.

▶ *INTEGRAL HP MOTORS*—Catalog describes integral hp motor with drip-proof, splash-proof, weather-protected design. Illustrates overhead, wall, floor positions for mounting. Marathon Electric Mfg. Corp., Wausau, Wis.

▶ *INTERVAL AND CYCLING TIMERS*—Bulletins PB-210, PB510, discuss company's interval timers, cycling timers, respectively. R.W. Cramer Co., Centerbrook, Conn.

▶ *ISOLATION MATERIAL*—Bulletin K5A describes "Elasto-Rib" rubber and cork damping material for controlling transmitted vibration, noise. Korfund Co., Inc., 48-15 32nd Pl., Long Island City, N. Y.



Threads ¼" to 10" pipe in seconds—right on the job . . . the Lawco, Jr.

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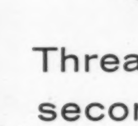
Here's the amazing portable power tool that threads pipe in a vise, on a wall, in a ditch . . . practically any place you can take a power cord!

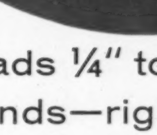
Light in weight (20 lbs.), the Lawco, Jr. eliminates the need for hauling heavy, bulky threading machinery to every job. All you do is position the Lawco, Jr. on the pipe, pull a trigger, and the cutting dies go to work for you. Lawco, Jr. is safe, and is easy to operate.

You can handle pipe from ¼" up to 10". The Lawco, Jr. is adapted for use with Ridgid OR dies for pipe up to 1" and with Ridgid 65-RC dies for 1" to 2" pipe. A square shank adapter drives standard cutting dies of larger sizes.

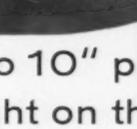
And pipe threading isn't all it can do. Below are other applications this versatile tool can handle for you, faster, better. Write for details.



Driving nuts and bolts.



Portable winch . . . easily hoists 500 lbs.



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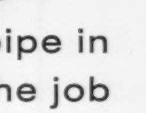

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VELOCITY POWER TOOL COMPANY
201 North Braddock Avenue, Pittsburgh 8, Pa.

RECENT TRADE LITERATURE *Continued*

▶ *MACHINERY MOUNTS*—Bulletin 546 contains information on company's leveling mounts, spring mounts. Barry Controls, Inc., 1000 Pleasant St., Watertown, Mass.

▶ *MEASURING, CONTROLLING LIQUID LEVEL*—Bulletin 1161 discusses principles of liquid level measurement, control, transmission. Various systems described. Minneapolis-Honeywell Regulator Co., Industrial Div., Wayne and Windrim Sts., Philadelphia.

▶ *MOTOR CONTROLS*—New 68 page catalog of control devices includes special section on motor control selection. General Electric Co., General Purpose Control Dept., Schenectady 5, N. Y.

▶ *MOTORIZED VALVE ASSEMBLIES*—Bulletin 8506 gives information for selection of valve bodies, linkages, power units, along with references to other data sources. Minneapolis-Honeywell Regulator Go., Industrial Div., Wayne and Windrim Sts., Philadelphia 44.

▶ *MOTOR-PUMPS*—Manufacturer's close coupled motor-pumps rated ½ to 75 hp for 5 to 2800 gpm delivery discussed in form 7093-E. 24 pages. Ingersoll-Rand, Cameron Pump Div., 11 Broadway, New York 4.

▶ *MOTORS*—Features of new "Uniclosed" motor contained in 12 page booklet. Cut open views of motor included. U.S. Electrical Motors, Inc., Box 2058, Los Angeles 54.

▶ *NYLON TUBING*—Flexible nylon pressure tubing described in new 6 page folder. For air, process, coolant, fuel and oil, lubricant, hydraulic lines. Polymer Corp., of Pennsylvania, Reading.

▶ *PACKINGS*—"Allpax" rod and sheet packings, gasket cutters, accessories, etc., discussed in new 52 page catalog. Allpax Co., Inc., Mamaroneck, N. Y.

▶ *PIPING IN DRYCLEANING PLANTS*—A new 40 page, 7th edition of *Drycleaners' handbook* gives details on cleaning systems, including diagrams which show a typical one-bath layout and both types of two-bath charged systems. Johns-Manville, 22 E. 40th St., New York 16.

▶ *PNEUMATIC CONTROL, TRANSMISSION SYSTEMS*—Bulletin 1120 describes pneumatic control and transmission systems, their applications, how they

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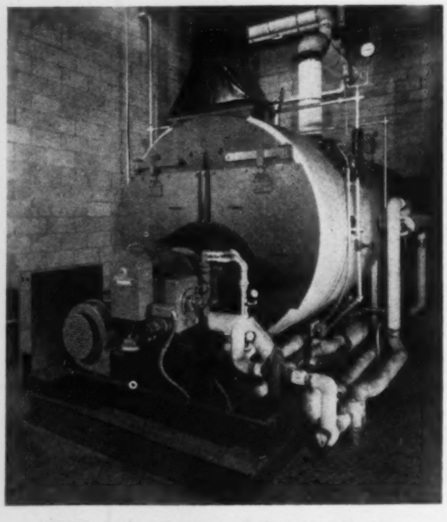

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RECENT TRADE LITERATURE
Continued

work. Minneapolis-Honeywell Regulator Co., Industrial Div., Wayne and Windrim Sts., Philadelphia 44.

▶ *PNEUMATIC INDICATING CONTROLLER*—New 12 page bulletin, 5A-13, describes company's "41A" pneumatic indicating controller for temperature, pressure, liquid level, humidity. New design features explained. Foxboro Co., Foxboro, Mass.

▶ *PORTABLE PIPE THREADER*—Specifications, operating features for portable power pipe threader, accessories, contained in new illustrated literature. Lawco, Inc., 217 W. 2nd, Hutchinson, Kan.

▶ *PROGRAMMER THERMOMETERS*—Specification sheet 602 describes integral cam programmer thermometers designed to maintain definite relationship between temperature and time. Minneapolis-Honeywell Regulator Co., Industrial Div., Wayne and Windrim Sts., Philadelphia 44.

▶ *PROPELLER FAN UNIT HEATERS*—Illustrations, technical data on construction, application, installation of redesigned propeller fan unit heaters contained in bulletin No. 1301-A. C. A. Dunham Co., 400 W. Madison St, Chicago.

▶ *PULLEYS*—Data sheet gives specifications for company's standard one piece pulleys, variable pitch pulleys, fractional horsepower and replacement belts. Replacement Parts, Inc., 22408 Lake Shore Blvd., Euclid 23, Ohio.

▶ *PUMP CHART*—Pamphlet *Pump Chart Spots the Trouble* designed to identify probable source of failure, erratic performance in rotary displacement pumps. Details over 25 trouble symptoms. Eco Engineering Co., 12 New York Ave., Newark, N. J.

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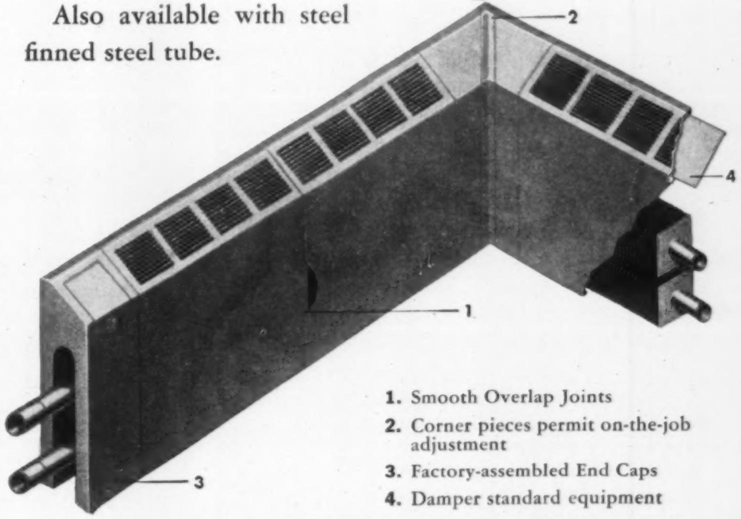

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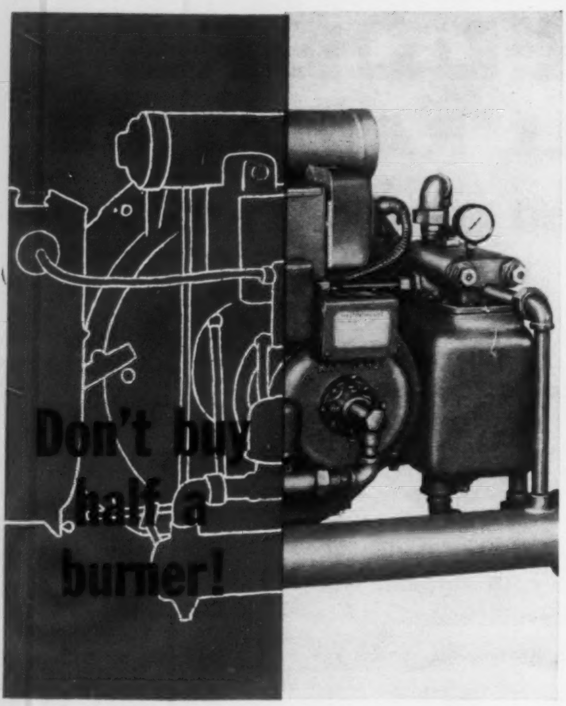

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RECENT TRADE LITERATURE

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▶ *PUMPS*—Pumps for air conditioning, refrigeration systems, 1/4 to 7 1/2 hp models, discussed in new catalog. Nonoverloading performance curves, specifications on design improvements included. Lancaster Pump and Mfg. Co., Inc., Lancaster, Pa.

▶ *PUMPS*—Bulletin 107 describes 19 models of two stage regenerative turbine pumps. Contains illustrations, diagrams showing principle of operation, data on seals available, installation dimensions, performance tables. Roy E. Roth Co., Rock Island, Ill.

▶ *RIVETS*—New 8 page booklet, TL-99, illustrates how blind rivets work, how they are being used in manufacturing, maintenance, repair work. Townsend Co., New Brighton, Pa.

▶ *ROOF VENTILATORS, VENT FLUE CAPS*—Catalog 446 gives weights, dimensions, applications, specifications, engineering and weather data on manufacturer's line of aluminum roof ventilators, vent flue caps. Design data sheet E1A is price list.

▶ *ROTAMETER KITS*—New 8 page bulletin includes illustrations, capacity charts, design and construction details, etc., for rotameter kits for research laboratory, pilot plant, field testing. Brooks Rotameter Co., Lansdale, Pa.

▶ *SILICONE PAINT*—New 6 page brochure discusses "Sili-Kool" heat-, rust-, corrosion-resistant silicone paint said to withstand heat to 1600 F, extreme weather conditions. C.H. Dragert Co., Inc., 2518 Chalk Hill Rd., Dallas.

▶ *SOLENOID VALVES*— New general catalog on solenoid operated valves describes five basic valves, discusses their possible variations. Has cross indexed price list. Skinner Electric Valve Div., The Skinner Chuck Co., Edgewood Ave., New Britain, Conn.

▶ *SPECIFIC GRAVITY INDICATOR*—Bulletin No. 800 gives design details, construction, operation principles for company's "Spee/Gee" specific gravity indicator designed for determining liquid densities for continuous sampling, other processing service. Brooks Rotameter Co., Lansdale, Pa.

▶ *STOKERS*—The manufacturer has released a new 12 page catalog on its fluid ram and gear drive single retort underfeed stokers, designed to handle loads of 100 to 360 developed hp. Cutaway sections and detailed parts show the construction of these two types. Erie City Iron Works, Erie, Pa.

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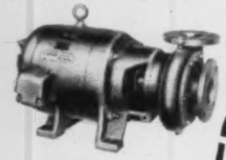
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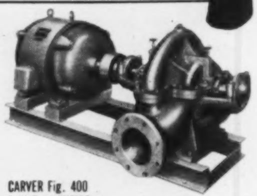
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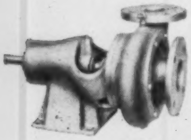
200 to 2000 G.P.M.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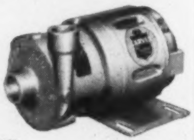
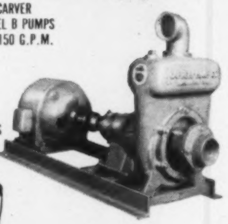
Type FL PUMPS
20 to 900 G.P.M.

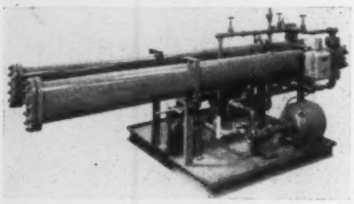

CARVER
MODEL B PUMPS
6 to 150 G.P.M.


CARVER Model KF PUMPS
Self-Priming
20 to 4000 G.P.M.

Ask for bulletins

CARVER
the quality name in pumps

STOP COMBUSTION PROBLEMS



USE Eagan PACKAGED Fuel Oil Pump & Heater Sets

Eagan PACKAGED Fuel Oil Pump and Heater Sets for combustion preparation of heavy industrial fuel oil are delivered ready to operate. That means they prevent the many combustion difficulties brought about by improper field assembled combinations. They heat to 300°F, pump up to 400 psi., have capacities to 3000 gph.—are easily installed and serviced.

Single or duplex units are available for steam or electric drive. Duplex "electro-steam" sets with one electric motor driven pump and one steam pump to provide for electrical failure can also be obtained. These PACKAGED Eagan units can be custom made to meet any specification.

Write for Bulletin or prices.

WALTER H. EAGAN CO., INC.

Mfrs. of condensate, vacuum, turbine, boiler feed, centrifugal, proportioning and fuel oil pump and heater sets.

Pump Specialists since 1920
2337 Wallace Street, Philadelphia 30, Pa.

RECENT TRADE LITERATURE
Continued

▶ *STUD WELDING*—Booklet covers ordering, engineering data on 12 most commonly used studs. Also review of applications, equipment. KSM Products, Inc., Stud Welding Div., Merchantville 8, N. J.

▶ *THERMOCOUPLES, PYROMETER SUPPLIES*—New 56 page bulletin P1238 is buyer's guide and user's manual for company's line of thermocouples, pyrometer accessories. Contains engineering data on selection, installation. The Bristol Co., Waterbury 20, Conn.

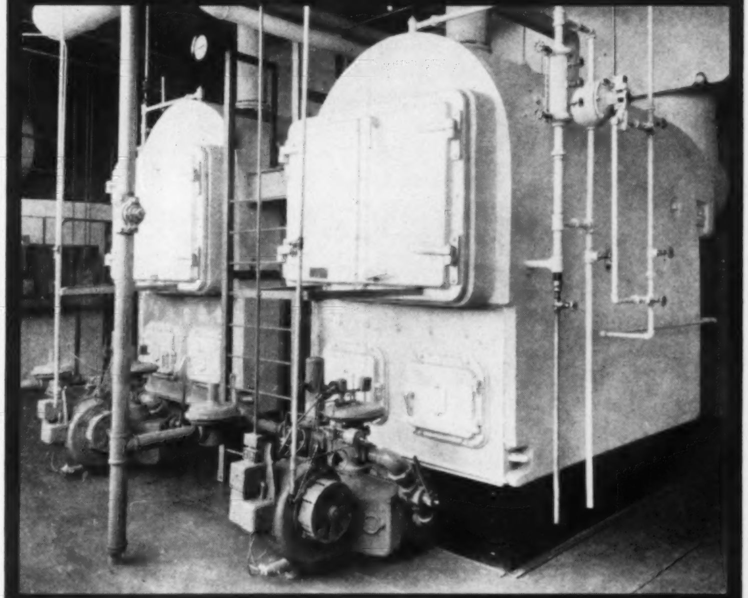
▶ *TUBING FOR ELEVATED TEMPERATURE, PRESSURES*—Folder TDC 177 shows chemical analyses of standard carbon, alloy, stainless tubing steels for elevated temperature and/or pressure service. Tubular Products Div., The Babcock & Wilcox Co., Beaver Falls, Pa.

▶ *UTILITY BLOWERS*—Dimensions, specifications and performance data on the company's new line of utility blowers, designed to be non-overloading, with backward curved blades is presented in bulletin BC-11. Hartzell Propeller Fan Co., Piqua, Ohio.

▶ *WALL MOUNTED AIR CONDITIONER*—New 4 page folder illustrates, gives specifications for wall mounted room air conditioner. In three models. Chrysler Airtemp, 1600 Webster St., Dayton.

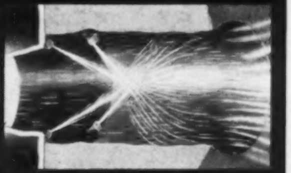
▶ *WATER HEATERS*—Guide to selecting correct commercial water heaters for various establishments to conform with AGA standards is contained in new 8 page catalog, form RS 100A. Ruud Mfg. Co., 2025 Factory St., Kalamazoo 24F, Mich.

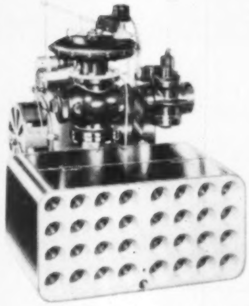
Mettler "FAN-AIR" Gas Burners chosen for unusual boiler installation



Here's the difference . . .

Unique Mettler "ENTRAINED COMBUSTION" design. Wide "turn down range" without backfiring. Four orifices per port (instead of the usual one), means top efficiency. Orifices are *replaceable*, too.





Functional use of color improves working conditions and actually makes this boiler room an attractive "show place." Choice of "FAN-AIR" Gas Burners for the boilers upgrades working conditions, too, because they're quiet . . . clean firing . . and safe! Safety is a standout feature of Mettler Burners. Their exclusive pilot rectification control system is a newer, more advanced method of safeguarding burners. Another "FAN-AIR" *first* is replaceable gas orifices . . . a feature that permits engineering the size of the orifice to each job, matching available gas pressure to desired input for ultimate in air-gas mixing. This gives you completely flexible application (with mechanical or natural draft) and maximum *efficiency* . . . at real money saving low cost.

Write for literature and specifications, today.

METTLER

Eclipse

THE METTLER CO., INC.

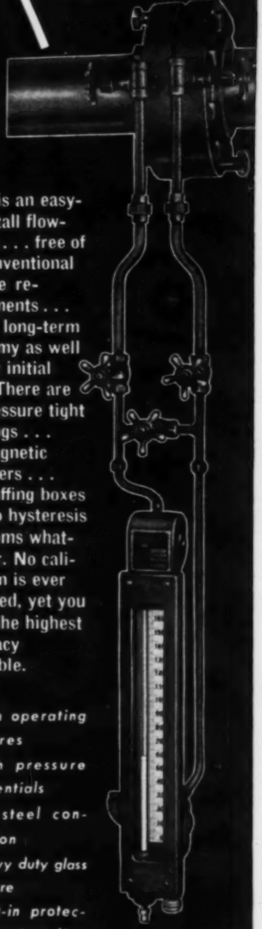
Division of ECLIPSE FUEL ENGINEERING CO.

4366 Worth Street, Los Angeles 63, California

UNMATCHED ACCURACY

in direct flow indication

Wherever you seek simplicity and high accuracy in flow measurement at lowest cost, the Meriam "H" Meter is the well-known answer.



Here is an easy-to-install flowmeter . . . free of all conventional service requirements . . . giving long-term economy as well as low initial cost. There are no pressure tight bearings . . . no magnetic followers . . . no stuffing boxes . . . no hysteresis problems whatsoever. No calibration is ever required, yet you have the highest accuracy available.

- ★ *High operating pressures*
- ★ *High pressure differentials*
- ★ *All steel construction*
- ★ *Heavy duty glass enclosure*
- ★ *Built-in protection against line surges*

Write for Bulletin 18A

Meriam Manometer Instrumentation
...for pressures, vacuums, flows, liquid levels.

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INSTRUMENT COMPANY

10920 Madison Ave. • Cleveland 2, Ohio

ALADDIN UTILITY SETS

- COMPACT
- TEN SIZES
- BELT DRIVEN
- SELF CONTAINED
- QUIET OPERATING

CERTIFIED RATINGS

Certified ratings are the result of tests made by the Manufacturer in accordance with the Standard Test Code for Centrifugal, Axial, and Propeller Fans adopted jointly by the National Association of Fan Manufacturers and the American Society of Heating and Ventilating Engineers.

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ALADDIN Belt-Driven Utility Sets are extremely quiet in operation. Designed for general ventilation, they occupy a minimum of space, handling large volumes of air at low noise levels. They are ruggedly built and are ideally suited for roof installation . . . when furnished with weatherproof cover they require no further protection against the weather.

ALADDIN Utility Sets are available with both forward curved or backwardly inclined blade wheels.

Write for complete data

ALADDIN HEATING CORPORATION
1111 WEST AVENUE 137 · SAN LEANDRO, CALIF.
REPRESENTATIVES IN ALL PRINCIPAL CITIES IN THE WEST

RECENT TRADE LITERATURE

Continued

▶ *WATER SOFTENERS*—Troubles caused by utilization of hard water, economies effected by curing them discussed in 20 page bulletin No. 2386-A. Permutit Co., 330 W. 42nd St., New York 36.

▶ *WATER, WASTE CONDITIONING*—Brochure WC-117 discusses industrial, municipal water and waste conditioning equipment. Illustrations of typical installations included. Graver Water Conditioning Co., 216 W. 14th St., New York 11.

▶ *WELDING*—New 32 page *DirectoRod Guide* (TIS 1340A) describes over 300 low heat input metal joining applications, procedures. Eutectic Welding Alloys Corp., Flushing 58, N.Y.

▶ *WELDING*—Performance, applications of new consumable electrode inert gas welding process given in 7 page booklet, B-6525. Westinghouse Electric Corp. P.O. Box 2099, Pittsburgh 30.

▶ *WROUGHT IRON PIPE*—*Wrought Iron Pipe Catalog* is 52 page manual containing technical information for specifiers of pipe, tubing. Tables list size, dimensional data of wrought iron pipe, tubular products. A.M. Byers Co., Clark Bldg., Pittsburgh.

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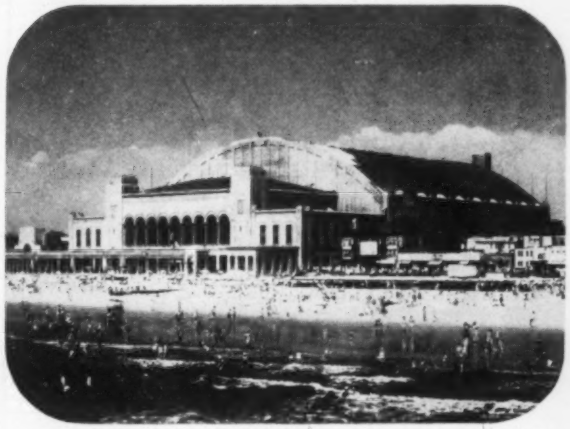
SPECIFICATION
and **BUYING**
INFORMATION

Use your complete, up-to-date

JANUARY DIRECTORY ISSUE

Your job will be a lot easier if you'll keep the January Directory issue of Heating, Piping & Air Conditioning constantly available for handy reference. It's one of your most valuable tools — one which will save you many hours of looking up the products you need for your various jobs. It's the ONE complete, up-to-date, readily accessible source of product information on who makes the pumps, valves, traps, compressors, specialties of all kinds, etc., you need — and where they're located. They're identified by trade names, too. EVERY product is listed, alphabetically arranged and printed on a distinctive yellow stock for easy reading and reference. Keep it handy . . . it's a time saver.



CONSULTING ENGINEER: S. B. STRAUSS, ATLANTIC CITY
CONTRACTOR: CLAREMONT ENGINEERING, PHILA.

Now!

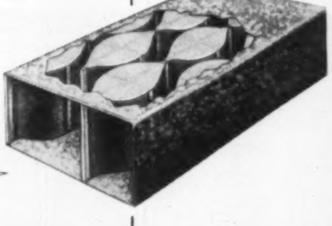
Aircoustat Silence at Atlantic City Convention Hall

Amazing Aircoustat *packaged* silencing for air conditioning is now quieting fan and air noise at this popular convention, trade show and exhibition headquarters.

Whatever the location of *your* next air conditioning installation, if *quiet* is required, Aircoustat will provide the practical, economical solution . . . just as it has at Atlantic City Convention Hall.

This compact, completely *packaged* unit is easy to install. Incorporated as part of the duct work, Aircoustat requires no special tools for installing. And results are amazing: one *7 foot* Aircoustat reduces noise level below what *100 feet* of old fashioned duct lining could accomplish . . . with low pressure drop.

Selection is no problem. Aircoustat is so engineered that if it fits geometrically, it fits acoustically.

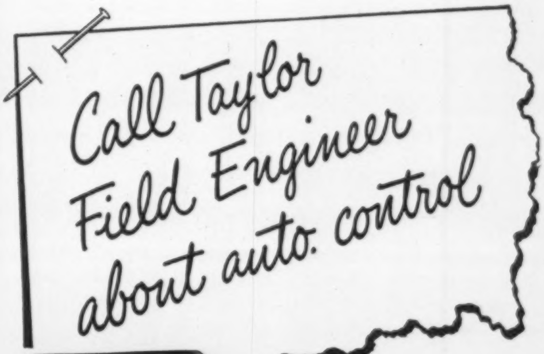


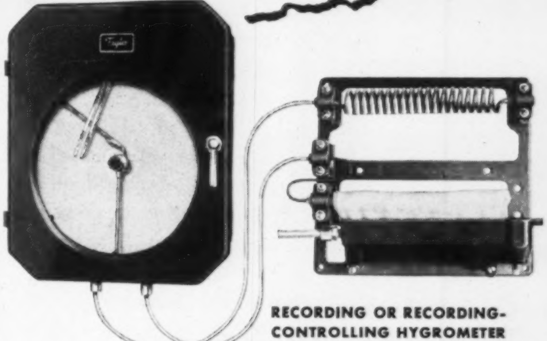
Write TODAY for complete information on

Aircoustat

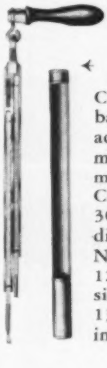
SILENCE SERVICE

Industrial Sound Control Inc.
45 Granby Street, Hartford 12, Conn.

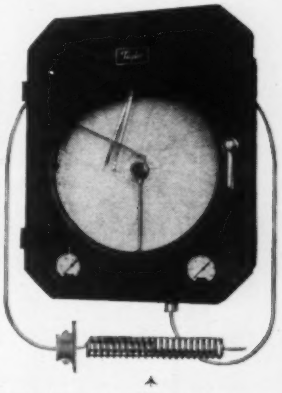




RECORDING OR RECORDING-CONTROLLING HYGROMETER with bottle or continuous water feed. Recommended under the following conditions: Good air circulation; panel advantageously located within apparatus room or duct for best circulation across the bulbs. Available with bottle-feed or continuous water supply.



TAYLOR SLING PSYCHROMETER Considered the basic standard for accurate measurement of relative humidity. Length 12″ Catalog No. 1321: 30° to 200°F in 1° divisions. Catalog No. 1322: 20° to 120°F in ½° divisions. Catalog No. 1324: 25° to 40° in 1/10° divisions.



TAYLOR FULSCOPE* TEMPERATURE CONTROLLER. Keeps lever motors, diaphragm valves, dampers, etc., in proper sequence to make your air conditioning system work perfectly. Automatically compensates for load changes. Controls refrigeration compressors. Gives you automatic seasonal changeover.

• • •

Ask your Taylor Field Engineer about these instruments, or write for **Catalog 5.** Taylor Instrument Companies, Rochester, N. Y., and Toronto, Canada.

*Reg. U.S. Pat. Off.

Taylor Instruments
MEAN ACCURACY FIRST

WHO'S WHAT . . .

▶ *YORK CORP.*—John R. Hertzler, deputy state secretary of commerce for Pennsylvania. Mr. Hertzler left York last year after 24 years with the company. During that time he served as director and vice president.

▶ *CORP. OF PROFESSIONAL ENGINEERS*—G. Lorne Wiggs, president. The firm of Wiggs Walford Frost & Lindsay, of which Mr. Wiggs is a partner, is opening a new office at 49 Metcalfe St., Ottawa in addition to its offices in Montreal and Toronto. Mr. Wiggs has authored several articles for HPAC.

▶ *EMERSON ELECTRIC MFG. CO.*—Edward L. O'Neill, vice president and general sales manager; R. E. Otto, vice president for motors; William L. Davis, Jr., assistant vice president for engineering.

▶ *DELTA HEATING CORP.*—William T. Goldsmith, national sales manager. Mr. Goldsmith comes to Delta from General Electric Co.

▶ *COBELL INDUSTRIES, INC.*—George A. Chappell, Jr., chief engineer in conjunction with the expansion plans of the company.

▶ *HAVENS STRUCTURAL STEEL CO.*—Carl C. Harris, sales manager for the company's cooling tower division.

▶ *CARRIER CORP.*—Elected to the board of directors: Lyle C. Harvey, senior vice president of Carrier; Francis H. Beam, senior vice president of the National City Bank of Cleveland; William A. McAfee, of a Cleveland law firm. Vice presidents elected are Ronald N. Campbell, Howard L. Clary and William J. Bailey.

▶ *MAMMOTH FURNACE CO.*—W. A. Matheson, Jr., vice president for sales and director.

▶ *FAIRBANKS, MORSE & CO.*—L. R. Gaiennie, vice president for personnel; John C. Elmburg, assistant general sales manager, effective July 1.

▶ *BARRY CONTROLS, INC.*—Russell T. Lowe, assistant chief engineer; Richard D. Cavanaugh, technical assistant to the chief engineer.

▶ *WORTHINGTON CORP.*—Hobart C. Ramsey, a board member of the National Industrial Conference Board for one year. Mr. Ramsey is chairman of Worthington. Aloysius M. Tullo has been appointed general manager of the company's newly established Harrison division.

VULCAN LINOVECTOR

PREFERRED ... In the "long run" it costs less

LINOVECTOR Fin-Tube Radiation is ideal for commercial installations. Strong and durable. Engineered for top heating efficiency. Fins are permanently imbedded in heating tube for best heat transfer. Linovector maintains an even, comfortable temperature from floor to ceiling. Stops heat loss in large glass areas. Blankets cold walls with a curtain of warm air. Saves valuable floor space. Made-to-measure enclosures and accessories are easy to install. Saves time . . . man hours . . . money on-the-job.

WRITE FOR LINOVECTOR CATALOG NO. 625A
*Trade-mark Reg.

Over 29 years a Leader in Fin-Tube Radiation.
Representatives in Principal Cities

The VULCAN RADIATOR COMPANY
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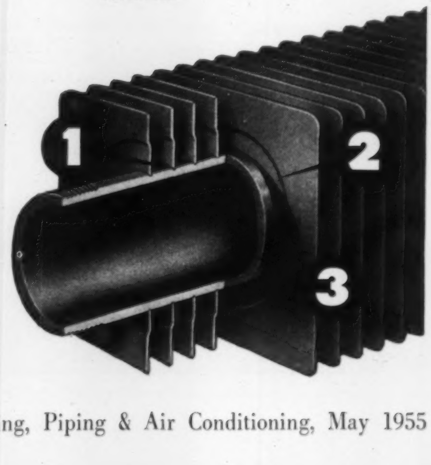
SCHOOLS
FACTORIES
HOSPITALS
PUBLIC BUILDINGS

COMPLETE I=B=R RATINGS

Cutaway View of Linovector
1. Fins imbedded for Best Heat Transfer.
2. Fins offset . . . for rigidity.
3. Steel Pressure Tube or hard-temper copper water tube.



WHO'S WHAT

Continued

▶ *THOR POWER TOOL CO.*—John B. Dempsey, manager of electric tool sales. A member of the Thor sales department for nearly 17 years, Mr. Dempsey was most recently Detroit branch manager.

▶ *ARMSTRONG CORK CO.*—Hobart C. Ramsey, a director; Dr. L. H. Dunlap, chemistry department manager. Mr. Ramsey is chairman and chief executive officer of the *WORTHINGTON CORP.*

▶ *ZURN MFG. CO.*—Edward J. Donn, manager of sales promotion.

▶ *AMERICAN WHEELABRATOR & EQUIPMENT CORP.*—Leslie L. Andrus, a director. He is a vice president of the corporation and executive head of its Dust & Fume Control Div.

▶ *CARRIER CORP.*—Richard H. Swart, Sr., director of engineering of the allied products division; William Hood, acting director of engineering of the unitary equipment division; Frank E. Purcell, national buyer sales manager at the company's Syracuse headquarters.

▶ *RIC-WIL, INC.*—Bradlee Pruden, vice president in charge of engineering.

▶ *O. A. SUTTON CORP.*—Dale W. Gordon, executive vice president; Harold W. Bartley, vice president for materials; Dan J. Mull, vice president for engineering; Robert G. Cordes, director of quality; Ralph S. Lowensohn, chief engineer; Fred Ricketts, assistant sales manager.

▶ *BEAVER PIPE TOOLS, INC.*—Eugene J. Cassella, assistant plant manager.

▶ *ATLAS VALVE CO.*—Harry T. Wentworth, general manager. Formerly he was chief engineer for the company.

▶ *YORK CORP.*—Sherman Loud, national accounts representative for the Commercial Div. in the New York office.

▶ *UNION CARBIDE AND CARBON CORP.*—Eugene Easterly, vice president for distribution, and E. G. Hickling, vice president for operations of Linde Air Products Co., a division of the company.

▶ *IRON FIREMAN MFG. CO.*—R. K. Handley, manager of the main Cleveland plant; Norman W. Stunkard, manager of the company's Swenson Thermal Research, Inc. plant, also in Cleveland.

NEW **WEINMAN**
type AC centrifugal pump for air conditioning systems

When outside atmospheres are laden with abrasive dust particles, recirculation of cooling water in air conditioning systems using cooling towers becomes a major maintenance headache. Shaft seals become worn far more quickly than normal and leakage occurs.

The Type AC pump was designed specifically by Weinman engineers to render long service under these conditions; in addition to a rotary type mechanical shaft seal, there is provided a reversible ceramic floating seat and carbon washer combination held by a stainless steel spring, insuring longer life and leakproof operation. The shaft is solid stainless steel, preventing rust or corrosion even when cooling water is chemically polluted.

CLOSE-COUPLED

MOUNTS IN ANY POSITION TO FIT REQUIREMENTS

Wherever thoroughly dependable, trouble-free circulation of hot or chilled water, pressure-boosting, or other general pumping needs are indicated, Weinman Type AC pumps will give superior service. If you have a pump problem, call your nearest WEINMAN Centrifugal Pump Specialist or write for Bulletin 725 . . . perhaps the Type AC pump is exactly what you need!

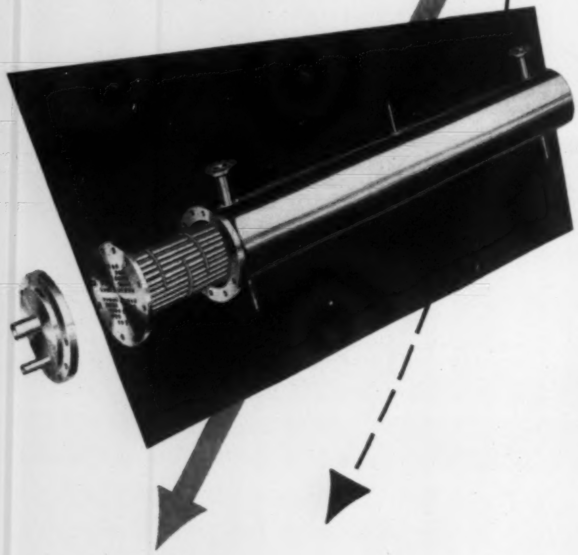
Representatives in principal cities.

Built by Centrifugal Specialists
The WEINMAN Pump Mfg. Co.
286 SPRUCE STREET • COLUMBUS 8, OHIO

Here's why

TACO CHILLERS

are easy, long-life installations!



CONTROLLED VELOCITY Refrigerant velocity is controlled through headpasses and tubes, to prevent oil-logging in the chiller.

Water velocity, through the shell, is controlled by engineered baffle spacing for efficient heat transfer without excessive pressure drop.

U-BEND CONSTRUCTION A TACO feature that eliminates any possibility of leaks at the rear end of the chiller.

Capacity Range: Up to 130 tons
Sizes: From 8" to 20" diameters
For use with Freon-12 and Freon-22

It pays all ways to install TACO *Quality Controlled* products.

Condensate Coolers • Converters • Chillers • Circulating Pumps
Fuel Oil Heaters • Oil Coolers • Tank Heating Units • Water Heaters

TACO HEATERS, INCORPORATED

1160 Cranston Street
Cranston 9, Rhode Island

Taco

WHO'S WHAT

Continued

▶ *L.O.F. GLASS FIBERS CO.*—Officers of newly formed company are: Randolph H. Barnard, president and general manager; Thomas A. Collins, vice president and assistant general manager; Francis H. May, Jr., vice president, secretary and treasurer; J. M. Johns, vice president and director of sales; Raymond W. Capaul, vice president and sales manager of the general products division; Clinton F. Hegg, vice president and sales manager of the textile division; Dominick Labino, vice president in charge of glass research and new product development; Jesse H. Plummer, vice president in charge of manufacturing, engineering and development.

▶ *BYRON JACKSON CO.*—Norman D. Jesse, vice president in charge of sales, service and branches of the company's pump division.

▶ *LUNKENHEIMER CO.*—Melvin W. Pauly, vice president in charge of sales; Harry A. Burdorf, who will complete 50 years with the company in June, continues a vice president; Chester C. Isekeit, vice president and treasurer; Eibe W. Deck, vice president in charge of manufacturing; Earl F. Riopelle, vice president in charge of engineering and research; Louis T. Huser, controller and assistant treasurer.

▶ *AEROFIN CORP.*—Russell V. Dunne, on special business survey assignment. Upon completion he will assume managership of the company's southeastern district. Mr. Dunne was associated with Carrier Corp. for many years.

▶ *JOSEPH T. RYERSON & SON, INC.*—Francis B. Makens, general superintendent of Chicago plant, Charles H. Hallett, assistant manager of sales at Chicago plant; William G. Findlay, manager of Detroit steel service plant.

▶ *GARLOCK PACKING CO.*—J. B. Sewell, a vice president directing the sales operations of the company.

▶ *SOLAR AIRCRAFT CORP.*—Eugene H. Ziebold, manager of industrial bellows sales department.

▶ *ALLIS-CHALMERS MFG. CO.*—Harold H. Heinecke, manager of commercial research department.

▶ *COSENTINI ASSOCIATES*—Owen S. Lieberg, new member of this New York City consulting engineering firm.

▶ *STERLING ELECTRIC MOTORS, INC.*—John R. Howell, vice president in charge of sales. Mr. Howell has been with Sterling for 27 years.

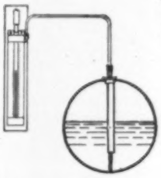
PETROMETER

4 steps

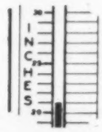
to Better
Measurement
of Tank Contents

The PETROMETER Tank Gauge offers you the convenience of Remote Reading plus these four extra features:

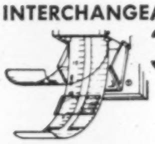
SIMPLE, TROUBLE-FREE DESIGN • • • 1 No complicated and troublesome pulleys, springs, or other mechanical or electrical gadgets—the Petrometer gauge operates on the principle of static pressure—a principle that is as unfailing as the law of gravity. Its operation is similar to that of the familiar U-tube. Simple, rugged and dependable.



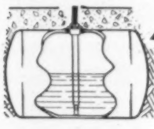
CONSTANT ACCURACY • • • 2 The large vertical scale on the Petrometer gives you constant, accurate readings. The red liquid column is clearly visible—moves up and down as contents vary, just like the liquid level in your tank.



INTERCHANGEABLE SCALES • • • 3 The scale on the Petrometer is readily removed or adjusted to correct for tank pitch or when changing liquids. No tools are needed.



EASY INSTALLATION • • • 4 Gauges can be installed on tanks above or below the ground and up to ¼ mile away. The tank assembly for the gauge can be installed even when the tank contains liquid. It can also be fitted in the tank separately to complete the tank work and the gauge connected any time later. Just tighten one simple connection and installation is complete.



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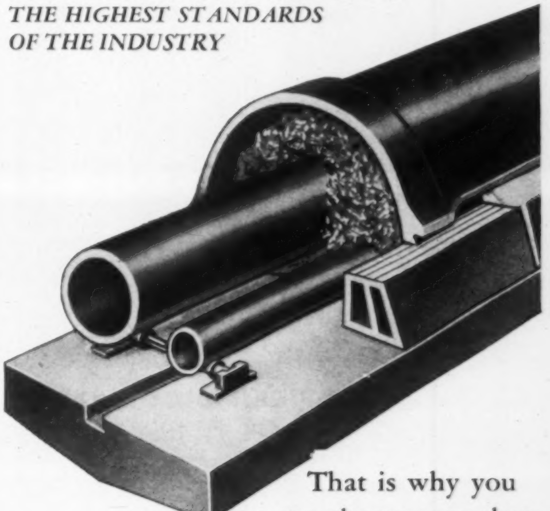
LIQUIDEPTH INDICATORS, INC.
43-22 TENTH ST., LONG ISLAND CITY 1, N. Y.

QUALITY
that has been Tops
for 45 Years

IN THAT TIME, WE HAVE ALWAYS MET, OFTEN EXCEEDED, THE HIGHEST STANDARDS OF THE INDUSTRY



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UNIVERSAL
Vitrified Tile CONDUIT

Gives Positive Protection

Universal Conduit and Base Drains are manufactured of hard surface salt-glazed vitrified tile to A.S.T.M. Standards. They are resistant to disintegrating action of electrolysis, water, acids, alkalies, rust and other corrosive elements.

The special Universal feature — interlocking construction and continuous Key-Lock side joints — assures a complete assembly of parts into a rigid watertight whole.

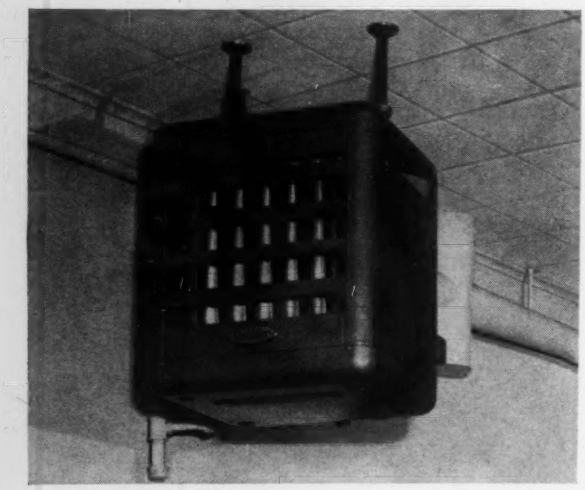
SEVERAL TYPES TO CHOOSE FROM

Now sold exclusively through Mundet Cork Corporation Distributors.

UNIVERSAL SEWER PIPE CORPORATION
Steam Conduit Division
1500 UNION COMMERCE BLDG. • CLEVELAND 14, OHIO

Carrier knows heating

Over fifty years of leadership in air conditioning have given Carrier unmatched experience in the control of temperature—heating as well as cooling. Yes, Carrier knows heating by experience—and all this engineering skill and leadership contributes to the superiority of Carrier Unit Heaters.



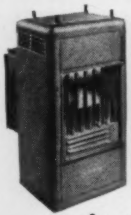
CARRIER GAS-FIRED UNIT HEATERS

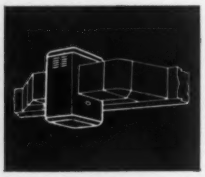
begin with the outstanding midget-size Model 46T50/70, shown above. Only 23 inches high and relatively light in weight, this propeller-fan type unit heater packs a hefty 50,000 to 70,000 Btu/hr. input (according to fan-motor size). It is designed for use when both space and heating requirements are important.

And for extra-long life, only the Carrier line embodies the major advantage of 16-gauge ALUMINIZED STEEL heat exchanger. It lasts far longer than one of ordinary furnace steel of heavier gauge. The dozen or more other Carrier features are equally impressive. Six additional sizes.

Get the complete story about the full Carrier gas-fired line . . . propeller-fan and duct models ranging up to 230,000 Btu capacity. WRITE or USE COUPON for a copy of the 12-page folder on Carrier Gas-fired Unit Heaters.

Duct-type unit heaters embody all the major structural and control features of the fan-propelled model—minus fan. By-pass duct application shown here permits year-round air conditioning through the Carrier Weathermaker System. Available in seven sizes.





Carrier

air conditioning
refrigeration
industrial heating

CARRIER CORPORATION, 305 S. Geddes St., Syracuse, N. Y.
Please send me the 12-page folder on Carrier Gas-fired Unit Heaters.
*Name*____________________
*Firm Name*____________________
*Address*____________________

WHO'S WHAT

Continued

▸ *TRANE CO.*—R. James Trane, Wayne J. Hood and Thomas J. Hancock, executive vice presidents. Mr. Hancock has also been named to the board of directors. Richard H. Pearse, Sr., was named a vice president. Mr. Trane will run the company's Scranton and Toronto operations in addition to his regular job as head of Trane's Canadian subsidiary; Mr. Hood continues as treasurer and adds finances and purchasing to his responsibilities; Mr. Hancock, who continues as head of the company's sales organization, will coordinate engineering and manufacturing.

Sales appointments are: Werner G. Wassmandorf, manager of reciprocating compressor sales department; Lloyd E. Eater, manager of fluid cooler sales department; Wilfred R. Barnard, head of UniTrane sales department.

▸ *GENERAL ELECTRIC CO.*—H. N. McMenimen, Jr., manager of sales for the air conditioning division; Carlos E. Dominguez, to the staff of the national accounts sales unit of the company's commercial and industrial air conditioning department.

▸ *HEATING AND COOLING COIL MANUFACTURERS' ASSN.*—Elected officers for 1955: W. C. Jones, president; L. A. Childs, vice president; G. W. McCormick, Jr., secretary-treasurer.

▸ *WHEELING STEEL CORP.*—Carl D. Burkland, chief industrial engineer; Chandler G. Lewis, assistant general manager of Martins Ferry, Ohio factory; T. J. Cox, a similar post at the company's Ackermann Factory at Wheeling.

▸ *A. O. SMITH CORP.*—J. H. Brinker, general manager of Permaglas Div.; S. E. Wolkenheim, director of marketing; R. J. Shepherd, general sales manager for Permaglas.

▸ *BARRY CONTROLS, INC.*—George P. Gardner, Jr., member of board of directors. Mr. Gardner is a partner in a brokerage firm.

▸ *KRITZER RADIANT COILS, INC.*—L. D. Mandell, vice president in charge of sales. He was formerly general sales manager.

▸ *CLEAVER-BROOKS CO.*—Elmer H. Wegner, vice president of manufacturing.

▸ *AIR REDUCTION SALES CO.*—H. H. Reed, national accounts manager; O. M. Donohue, metropolitan New York district manager, succeeding Mr. Reed.

FLEXIFLO

THE DIFFUSER WITH A BUILT-IN VOLUME CONTROL

FLEXIFLO adjustable air diffusers reduce installation costs by providing for rapid, easy adjustment of air volume and pattern after installation by simple knob adjustment.

Engineering is simplified since the FLEXIFLO's wide range of adjustability provides wide latitude in selecting the correct size diffuser.

FLEXIFLO diffusers assure uniform air distribution with built-in equalizing deflectors which are easily adjustable *after* installation. Rapid draftless mixture of supply and room air is assured.

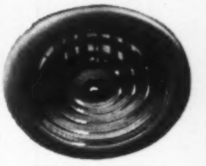
FLEXIFLO diffusers for every cooling, ventilating and heating need are made in 12 standard sizes, up to a capacity of 12,000 CFM.

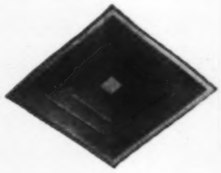
FOR COOLING

TYPE R—Air travels in a constant pattern parallel to the ceiling regardless of volume adjustment.

FOR COOLING & HEATING

TYPE V—Air diffusion pattern and volume are fully adjusable, after installation.



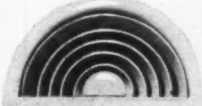


SQUARE

TYPE H—Fully adjustable square diffusers and fixed rectangular 2, 3, and 4 way diffusers.

FOR SIDEWALL & CEILING

TYPE S—With Type R or V blades to supply desired air pattern for ceiling or wall installation.



Write for technical data catalog on Flexiflo line

Universal Diffuser Corp.

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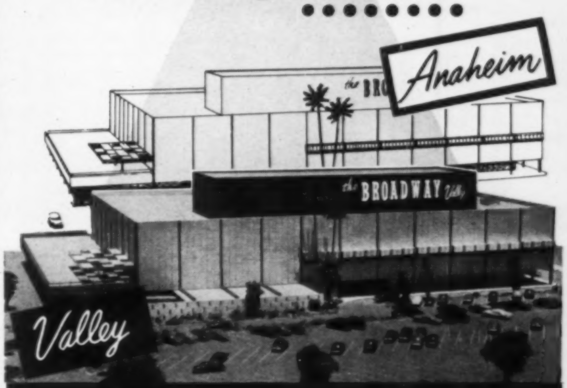
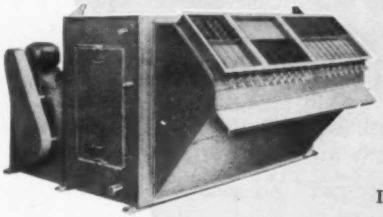
the BROADWAY'S having twins!



drayer-hanson's A PROUD PAPA...

A downtown L. A. department store giant,
Broadway-Hale, Inc., gearing for
the zooming suburban market, is building
two branch beauties, simultaneously –
The Broadway Valley, The Broadway Anaheim.
The twins are identical!
Only thing that varies is the name.



PART OF THE *d-h* TEAM!

FLEXAZONE

AND, both will be air conditioned for year-round comfort by Drayer-Hanson's popular heavy air-handling units – Flexazone's and HH's. Over 521,000 cfm's in all! Look at the "extras"... Electrically-welded angle-iron frame construction, vinyl-coated glass fibre insulation... and more. Details? Request bulletins C-4.20, C-4.22.A.

Architect: Welton Becket, FAIA, and Associates, Los Angeles;
Air Conditioning Contractors:
Valley, F. B. Gardiner Co., Inc.
Anaheim, Mehring-Hanson, Inc.

d-h SINCE 1910

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To give you better, faster, lowest-cost fastening into steel and concrete, RAMSET SYSTEM provides this practical 3-way combination:

1. The versatile RAMSET Jobmaster Tools and Fasteners
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These add up to the most powerful help to reduce your costs and increase your Profit Margins. To get the benefit of this complete, exclusive service, just call your local RAMSET dealer or mail the coupon.

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COMPANY ____________

ADDRESS ____________

CITY ____________ ZONE ____ STATE ____________

WHO'S WHAT

Continued

▶ *NATIONAL ASSOCIATION OF CORROSION ENGINEERS*—F. L. Whitney, Jr. of Monsanto Chemical Co., president; W. F. Fair, Jr. of Koppers Co., Inc., vice president; R. A. Brannon of Humble Pipe Line Co., reelected to a sixth term as treasurer. Corporate member directors are Robert R. Pierce, Pennsylvania Salt Mfg. Co. and C. G. Munger, Amercoat Corp. W. H. Stewart, Sun Pipe Line Co., was elected active member director.

▶ *DELAVAN MFG. CO.*—Elected to the board of directors: Nelson B. Delavan, W. Earl Safris and B. Sheldon Goreham. Company officers for 1955 are Mr. Delavan, president; Mr. Safris, vice president; Mr. Goreham, secretary treasurer; David T. Morgenthaler, vice president—director of sales; Phil Tamasi, vice president in charge of production; H. F. Rothwell, vice president in charge of engineering.

▶ *DRICO INDUSTRIAL CORP.*—Clark H. Minor, a director; Albert De Chiara, Jr., vice president and general manager; Albert J. Carter, vice president in charge of engineering.

▶ *ANSUL CHEMICAL CO.*—Richard Baker, public relations director; Brad Sebstad, advertising manager. Mr. Baker will also serve as a special assistant to Robert C. Hood, president of the company.

▶ *COMBUSTION ENGINEERING, INC.*—E. M. Halkyard, a trustee at large for the Boilermakers National Health and Welfare Fund. Mr. Halkyard is Combustion Engineering's personnel director.

▶ *IRON FIREMAN MFG. CO.*—Wayne F. Strong, president; Frank S. Hecox, vice president and treasurer; W. J. O'Neil, C. T. Burg, E. C. Webb, vice presidents; C. C. Craft, secretary; H. J. Mack, controller.

▶ *AIR-MAZE CORP.*—Bruce W. Carkin, sales engineer of railroad and original equipment installations; Bennett T. Church, manager of distributor sales.

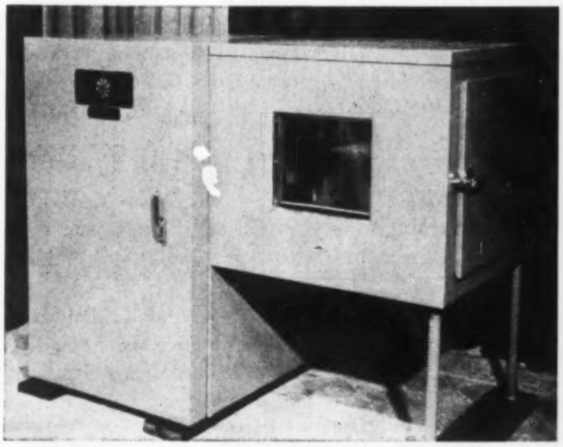
▶ *CLEVELAND FUEL EQUIPMENT CO.*—George A. Short, chief engineer.

▶ *HAPMAN-DUTTON CO.*—T. W. Eshbach, boiler sales manager for the Dutton Boilers Div.

▶ *ROCKWELL MFG. CO.*—W. D. Willes, product manager for the company's line of "Nordstrom" valves.

▶ *AMANA REFRIGERATION, INC.*—E. W. Lyon, sales manager for room air conditioners.

NEW NIAGARA



AIR CONDITIONED TEST CABINET

USES—to determine effects of controlled temperature and humidity conditions on test subjects of all kinds—to test processes—to find optimum conditions.

RANGE—With water and electric power services only, the range is from freezing temperature up to 150°F (dry bulb). With refrigeration, and using Niagara No-Frost Liquid to prevent freezing of sprays, you achieve dew point temperatures as low as minus 30° F. Control of relative humidity from 5% to 95% is obtained at all temperatures in this range. Air capacity is 200, 400 or 600 c.f.m.

METHOD—Air is saturated in the air-conditioning unit at the required dew point temperature and reheated to the desired dry bulb temperature. This is the method of the Niagara Type A Air Conditioner which has been proven for the most exacting duty over twenty-five years.

CONTROL—The dew point thermostat is located in the air stream, the dry bulb thermostat in the test cabinet. No moisture sensitive instruments are needed. Recorders may be used to obtain a complete record of conditions.

TEST CABINET—(inside) dimensions are 30" x 28" x 24" with access clear opening 26" x 22". Insulation is the equivalent of 4" cork.

AIR CONDITIONING UNIT is enclosed in an insulated cabinet adjoining the test cabinet. A door the full size of the cabinet wall gives complete access.

Write for Complete Information. Address Dept. HP

NIAGARA BLOWER COMPANY

405 Lexington Ave. New York 17, N. Y.

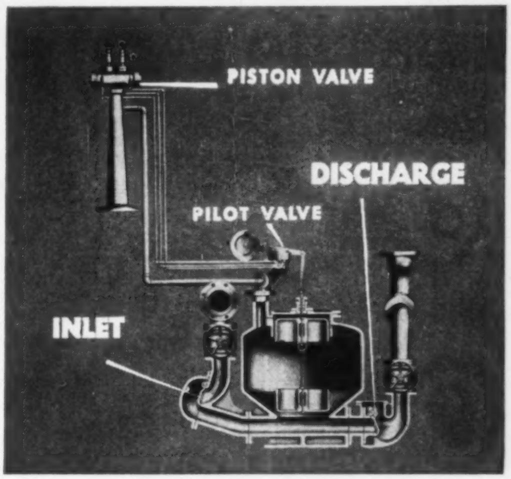
District Engineers in Principal Cities of United States and Canada

We couldn't buy valves

that would stand up in the service required of the

SHONE®

Pneumatic Sewage Ejector



so we build these valves ourselves!

SHONE valves — one of the reasons for SHONE Ejector performance and dependability — are built in Yeomans plant. Yeomans' experience has taught them where the vital areas are in a pneumatic ejector, and the years have taught them how to make these parts so they will stand the abuse required by sewage and waste handling pumps.

Pilot valve and piston valve are designed to work together. The pilot valve actuates the piston valve that admits compressed air to the receiver and pushes liquid waste out and up through the discharge line. Inlet and discharge check valves pass solids up to 4 inches in the smallest unit and rectangular water passages give greater flow area than the pipes with which they are connected. Reverse bend of inlet valve assures closing as solids drop clear. Solid bronze flaps and hinges can take the pounding of operating twice a minute year after year.

Learn more about this amazing pump

that gives endless years of service without repairs or attention. Contact your local representative listed in the Yellow Pages of your telephone book under "Pumps" or attach coupon to company letterhead and mail direct.

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Send by return mail SHONE Pneumatic Ejector Bulletin 4005.

Name .... Company ....

Address ....

City .... Zone .... State ....

WHO'S WHAT

Continued

▶ *BABCOCK & WILCOX CO.*—M. Nielsen, executive vice president; Paul R. Grossman, director of research; L. S. Wilcoxson, vice president in charge of the company's boiler division; George W. Kross, Jr., superintendent of the Tubular Products Div. plant at Alliance, Ohio.

▶ *MANNING, MAXWELL & MOORE, INC.*—J. Robert Kelley, executive vice president, Chester H. Butterfield, vice president of operations, Charles A. Moore, vice president and treasurer.

▶ *FLEXONICS CORP.*—George T. Toepper, vice president in charge of manufacturing; Thomas K. Wells, vice president incharge of sales.

▶ *NIAGARA FILTERS DIV., AMERICAN MACHINE AND METALS, INC.*—R. M. Hammes, general sales manager.

▶ *A. M. BYERS CO.*—Harry R. Rowland, general manager of sales; Edgar L. Fix, manager of steel sales.

▶ *LAU BLOWER CO.*—William W. Morrisey, sales manager of the blower division; John A. Jennens, controller.

▶ *CONOFLOW CORP.*—Warren H. Brand, vice president in charge of engineering and research.

▶ *OLIN MATHIESON CHEMICAL CORP.*—E. N. Rousseau, to the staff of the general manager to be available for special assignments pertaining to any phase of metals division operations; James J. Clarke, sales promotion manager of the company's Ramset Div.

▶ *TORRINGTON MFG. CO.*—John DeKoven Alsop, a director. Mr. Alsop is president, treasurer and director of a fire insurance company in Hartford, Conn.

▶ *SCHEMENAUER MFG. CO.*—George L. Palmer, vice president and controller. Mr. Palmer was formerly vice president and treasurer of Willys Motors.

▶ *LADISH CO.*—Fred K. Krell, assistant sales manager for the company's fittings division.

▶ *TENNEY ENGINEERING, INC.*—John L. Strauchon, to project-sales engineering staff.

▶ *MICHIGAN ENGINEERING SOCIETY*—Samuel D. Porter, president. Mr. Porter is a partner in the firm of McNamee, Porter & Seeley, consulting engineers at Ann Arbor.

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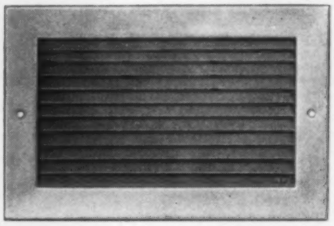
Since 1902

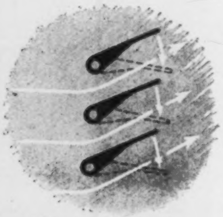
★ THE COMPLETE LINE OF AIR DIFFUSION EQUIPMENT ★

FIRST CHOICE FOR PERFORMANCE AND APPEARANCE

Meet *every need* for modern Air Diffusion Equipment with WATERLOO . . TOPS in architectural beauty, LOW in decibel rating. Custom-finished one-piece appearance, with bevelled edge frame which adds to interior decoration.



3H Return Air Grille



Exclusive WATERLOO *Silent Flow* TEAR DROP LOUVRE DESIGN

Only Waterloo Equipment offers this unique design, providing unobtrusive diffusion with *sufficient surface* to turn high velocity air without turbulance.

Leading architects, engineers and contractors consistently specify WATERLOO for the nation's finest hospitals, churches, schools, hotels, office, government and industrial buildings, theatres and restaurants.

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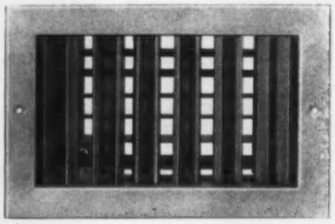


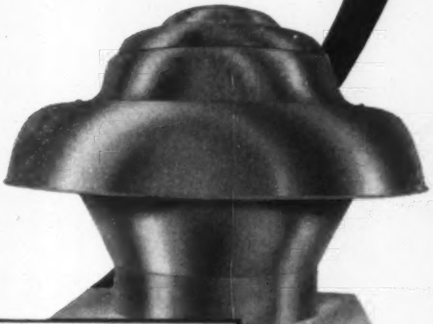
2VO Supply Register with opposed blade damper

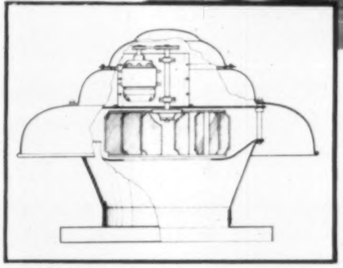
install kitten-quiet VENTILATION

Specify the

PENN

DOMEX





Low velocities and low rotational speeds are combined in the Domex to provide the hushed air movement so necessary in modern building ventilation.

V-Belt driven centrifugal fans in attractive and ageless spun aluminum housings permit capacity selections from 400 to 4000 cfm. This also permits standardization of roof openings and provides a uniformity of appearance and height for all roof mounted fans through this wide range of capacities.

The Penn Ventilator man in your area has complete data on these versatile exhausters as well as the other powered and gravity ventilators in Penn's complete line.

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FOR MORE THAN 25 YEARS THE BUILDERS' roof TOP LINE

They SELL! They PLEASE!

AURORA CLOSE-COUPLED *Packaged*

AIR CONDITIONING PUMPS

for
EVAPORATOR
COOLING
TOWERS
●
AIR
CONDITIONING
UNITS
●
also for
GENERAL
SERVICE

These are outstanding pumps, high in favor with air conditioning contractors and manufacturers of air conditioning equipment. Mechanical seal requires no packing or maintenance. Disassembly without disturbing pipe connections or hold down bolts.

- **LOW COST**
- **SMOOTH, QUIET**
- **DEPENDABLE**
- **LONG LIVED**
- **MECHANICAL SEAL**
- **DISASSEMBLY is QUICK, SIMPLE**
- **CARRIED IN STOCK**

AURORA
PUMP CO

Capacities up to 150 G. P. M., Heads to 100 Ft.

Aurora Type JMC Pump — Close-Coupled

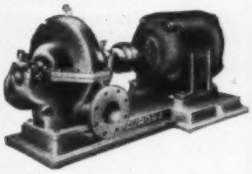
CASINGS vertically split. Casing wearing ring standard.

MECHANICAL SEAL—standard, located in packing cover.

IMPELLER — balanced, enclosed type, high grade bronze.

MOTOR—NEMA specs., stainless steel shaft on JMC — for all circuits and various enclosures.

BALL BEARINGS — on JMC, built into motor.



OTHER AURORA AIR CONDITIONING UNITS

We are also in a position to supply various sizes of air conditioning pumps in V-Belt drive, and flexible coupling drive. Our large size type G.M.C. Close-Coupled Pumps can be furnished up to 800 G.P.M. and heads to 200 ft.

ALSO — AURORA SPLIT CASE CENTRIFUGAL PUMPS

— single and two stage for water supply, handling condenser circulating water, brine circulation, booster service and many other duties.

Complete Information on Request

AURORA PUMP DIVISION
THE NEW YORK AIR BRAKE COMPANY
80 LOUCKS STREET AURORA • ILLINOIS

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Fairbanks Valves fill the specs.

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Proven to give longer service under difficult operating conditions, proven lower in maintenance costs!

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notable addition to the Manhattan skyline. New York City's first aluminum-faced skyscraper. A great construction achievement by the Tishman Realty & Construction Co., Inc., 445 Park Avenue, New York 22, New York. Architect: Emory Roth & Sons. Consulting Engineer: W. R. Cosentini & Associates, New York. Heating, Ventilating & Air Conditioning: Raisler Corporation, New York. Plumbing: John Weil Plumbing Corp., New York. Sprinkler: Raisler Corporation.

Men who know valves best specify and order Fairbanks Valves. For these men have learned that Fairbanks Valves insure trouble-free control of water, steam, gas, or oil. They know that Fairbanks Valves are engineered, designed, and manufactured to the highest standard of the industry. And they know that Fairbanks Valves fill their every requirement, for Fairbanks makes the complete line of bronze and iron body valves. YOURS Without obligation, send for Fairbanks Valves Brochure, describes, with cutaways, complete line of Fairbanks Valves.

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Branches: New York 3, Boston 10, Pittsburgh 22, Rome, Georgia
Valves • DART & Pic Unions • Trucks • Casters • Wheels

WHO'S WHAT

Continued

▸ *RELIANCE ELECTRIC & ENGINEERING CO.*—Richard A. Geuder, assistant general sales manager; Edward E. Helm, duties of coordinator of activities in merging the efforts of recently acquired Reeves Pulley Co. Div. with the other activities of the company. Mr. Helm is the company's sales vice president. Thomas W. Astle is promoted to sales engineer in the Buffalo office.

▸ *HAYS CORP.*—Orval W. Riggs, vice president in charge of sales; Louis E. Hapke, controller; Robert E. Navin, assistant to the executive vice president.

▸ *PRESBYTERIAN HOSPITAL,* Chicago—John A. Holbrook, assistant director of physical plant. Mr. Holbrook succeeds Philip Seeskin who will supervise any new construction and maintenance in the present building.

▸ *O. A. SUTTON CORP.*—Joe F. Dolland, vice president in charge of manufacturing; Robert G. Cordes, director of quality; Ed. J. Borowiec, chief product engineer; Ted D. Brown, chief motor engineer.

▸ *JOY MFG. CO.*—Louis G. Helmick, Jr., vice president of manufacturing.

▸ *RESEARCH-COTTRELL, INC.*—Charles E. Beaver, a vice president; Schaeffer E. Specht, assistant sales manager.

▸ *PYLE-NATIONAL CO.*—William C. Croft, to newly created position of executive vice president. Mr. Croft was formerly works manager and vice president in charge of production.

▸ *LINDE AIR PRODUCTS CO.*—R. S. Abrams, manager for new silicones plant at Long Reach, W. Va.

▸ *WESTINGHOUSE ELECTRIC CORP.*—Arthur G. Tichenor, manager of manufacturing, industrial products division.

▸ *NIAGARA BLOWER CO.*—Martin H. Olstad, vice president in charge of engineering; William M. Mosler, secretary.

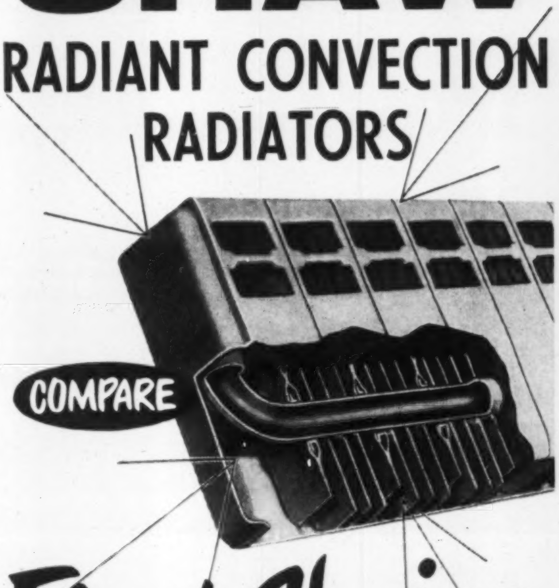
▸ *UNION ASBESTOS & RUBBER CO.*—Albert Rebel, manager of newly organized export division for air conditioning products.

▸ *AMERICAN BLOWER CORP.*—Robert L. Stickley, assistant advertising manager.

▸ *WALWORTH CO.*—T. D. Hyatt, assistant treasurer.

SHAW

RADIANT CONVECTION RADIATORS



First Choice

FOR HEATING

- rugged construction
- full length steel heating plates
- extra heavy copper tubing
- balanced combination of radiant-convected heat
- 3"—space saving design
- high heating efficiency
- lifetime beauty—no upkeep
- right or lefthand supply tapping
- factory assembled—one piece units
- fast, easy installation

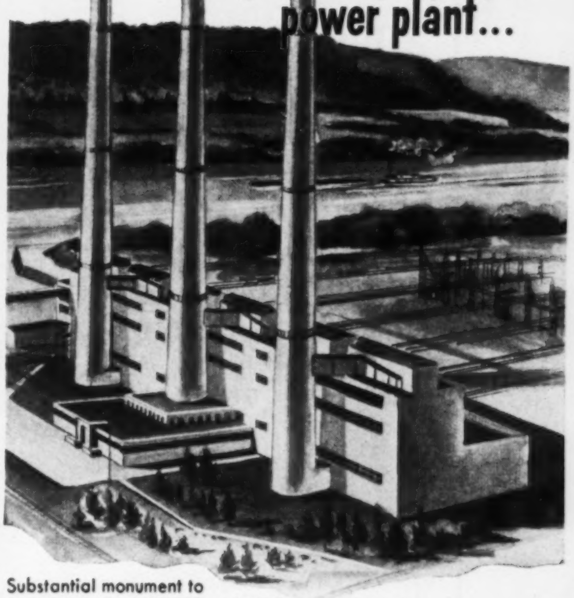
Regardless of heat-source . . . steam or hot water . . . Shaw provides a perfect ratio of radiant-convected heat. Schools, Hospitals, Institutions, Office Buildings, Industry and the Home have long demanded a more compact and efficient radiator combining ruggedness of construction with beauty and efficiency.

There is a Shaw radiator available for every heating application. The Shaw Panel Baseboard with the long, low, thin look for modern baseboard heating. The Shaw Panel Radiator for under windows or areas requiring utmost efficiency and with small available space. The Perkins Industrial Radiator for the factory, warehouse, and where uniform, constant heat is desired and is not obtained with the on and off type blast heating common with unit heaters.

SP-3

SHAW-PERKINS
MANUFACTURING CO.
201 EAST CARSON ST. PITTSBURGH 19, PA

How miller welders helped seal the arteries of America's largest single purpose power plant...



Substantial monument to Free Enterprise is OVEC and IKEC, suppliers of electric power to the Atomic Energy Commission's new uranium diffusion center in Pike County, Ohio.

Ohio Valley Electric Corporation and its subsidiary, Indiana-Kentucky Electric Corporation, agreed to supply electric power to this great new atomic production center . . . *15 billion kilowatt-hours annually.*

Two huge generating stations are being built: The Kyger Creek Plant at Cheshire, Ohio will have five generating units of 200,000 KW each; Madison, Indiana's Clifty Creek plant will produce 1,200,000 KW with its six big generators. Each of the eleven turbo-generating units will operate off a single boiler, with super-heated steam reaching 1,050 degrees Fahrenheit under 2,000 lbs. pressure per square inch! The high temperatures and reheat, which the sponsor companies have pioneered in their own right, will make these two plants among the most economical, most efficient generating stations in the country.

These same elements, however, make the fabrication of faultless high-pressure steam lines vital . . . and extremely difficult. To accomplish this extremely important task, pipe welding specialists equipped with the maximum of engineering skill utilized the Miller Selenium Rectifier d-c Arc Welder.

". . . . if it's Miller, you *know* it's the *finest!*"

Miller Selenium Rectifier d-c Arc Welder, in four wide-range models. For complete, concise, worthwhile information on these and other Miller Arc and Spot Welders, contact us today . . . at no obligation, of course.

miller

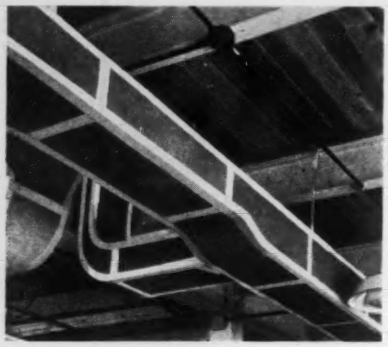
ELECTRIC MANUFACTURING COMPANY, INC.
APPLETON, WISCONSIN

COSTS MORE and WORTH IT!

Grant Wilson

DUX-SULATION

ASBESTOS PROTECTED



Despite the advent of many lower priced insulations, many of the nation's leading architects and engineers continue to specify Grant Wilson Dux-Sulation. One reason is that Dux-Sulation is just about indestructible — can't possibly be crushed or cracked. Its insulation and sound absorption efficiency, high to start with, *cannot* be impaired during installation.

Dux-Sulation can't powder, shift or sift. There are no "thin" spots, even at corners. There is no deterioration of any kind, no change of any kind. Insulating values are constant, indefinitely!

Special adhesive and tape (supplied) obviate the need for any additional "fasteners". If desired, Dux-Sulation can be applied in the shop and still withstand all necessary handling. On all counts, especially on projects where nothing less than the best is acceptable, Dux-Sulation is still your logical choice — the insulation you can specify with *absolute confidence* . . . no ifs, ands or buts!

write for Bulletin 567H-5

Grant Wilson inc.

ASBESTOS and INSULATING MATERIALS

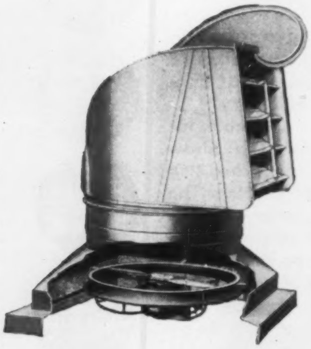
141 WEST JACKSON BLVD. • CHICAGO 4, ILLINOIS

Swartwout *Airjector*— the powered rotary ventilator that gives you TWO ventilators in ONE

Power or gravity ventilation, as the load varies

If the type of your operations or the construction of your buildings requires *power* ventilation, Swartwout Airjector gives you efficiency and economy — combined with pleasing appearance. If your operations produce extra floods of heat at certain periods but need only moderate ventilation otherwise, Airjector handles both jobs admirably. It supplies large capacity power expulsion when you need it; free gravity flow of heat and air when the capacity requirement is less.

Made in 13 throat sizes, Airjectors can be supplied in over 100 capacity variations to suit specific needs. Also available with "very quiet" fans.



Get the full story about Airjectors in our Bulletin AJ-F.

Swartwout's complete line of gravity and powered ventilators and ventilating louvers is found in Sweet's Architectural and Plant Engineering Files.

18511 Euclid Avenue, Cleveland 12, Ohio

The Swartwout Co.

Roof Ventilators and Ventilating Louvers

POWER PLANT EQUIPMENT • PROCESS INDUSTRY CONTROLS

WHO'S WHAT

Continued

▶ *SERVEL, INC.*—Walker A. Messick, manager of manufacturing engineering; John W. Bullock, sales manager for room air conditioners.

▶ *ENTERPRISE ENGINE & MACHINERY CO.*—F. R. Belville, manager of company's special products section.

▶ *LEWYT CORP.*—Irving Bottner, vice president of Tywel Mfg. Corp. Mr. Bottner is treasurer of Lewyt.

▶ *D. J. MURRAY MFG. CO.*—W. A. Marquardt, assistant manager.

▶ *SWARTWOUT CO.*—Joseph P. Green, director of engineering.

▶ *QUAKER RUBBER CORP.*—W. H. Parkinson, advertising, publicity, and sales promotion manager.

▶ *TUBE TURNS*—Jack D. Tolliver, manager of recently established sales development division.

▶ *PERMUTIT CO.*—Sheller L. Steinwender, vice president.

▶ *PHOENIX MFG. CO.*—Henry L. Charlton, assistant to the president in charge of sales and manufacturing.

▶ *SORENG PRODUCTS CORP.*—Gilbert R. Calkins, vice president, director of sales.

▶ *PENNSYLVANIA SALT MFG. CO.*—William P. Drake, executive vice president and member of the board of directors.

▶ *ROBINSON AVIATION, INC.*—Robert A. Sprung, manager of regional representatives.

▶ *MECHANICAL HEAT & COLD, INC.*—Willard H. Sherman, president.

▶ *HAJOCA CORP.*—S. F. Kratzinger, secretary of the company. He succeeds Benjamin Cadbury, retiring.

▶ *FLEXIBLE TUBING CORP.*—Eugene G. Swartz, a director; Howard W. James, manager of marketing.

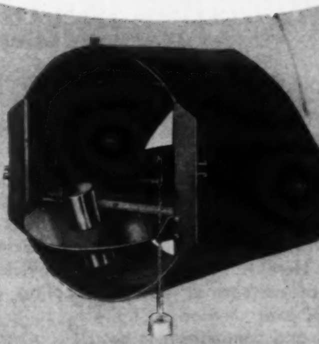
IN THE TERRITORIES . . .

(Recent sales appointments)

▶ *TRION, INC.*—L. Todd Merrill, regional sales manager for the company's South-Central territory comprised of southern Illinois, western Tennessee, Mississippi, Missouri, Kansas, Oklahoma, Texas, Louisiana and Arkansas.

For commercial & industrial heating with

GAS



field

"MG" Draft Controls are recommended by the nation's leading gas companies as

SAFE

Now you can eliminate heavy fuel wastes with complete safety. With four years of perfect performance behind it the Field "MG" now carries the recommendation of leading gas companies across the country—fully safe, absolutely dependable, highly efficient. But be sure the control you install is a Field. In a gas installation only a perfect control is a good control.

Write **for technical information and performance data on the Field "MG" Draft Control.**

FIELD CONTROL DIVISION

of H. D. Conkey & Company — Mendota, Illinois

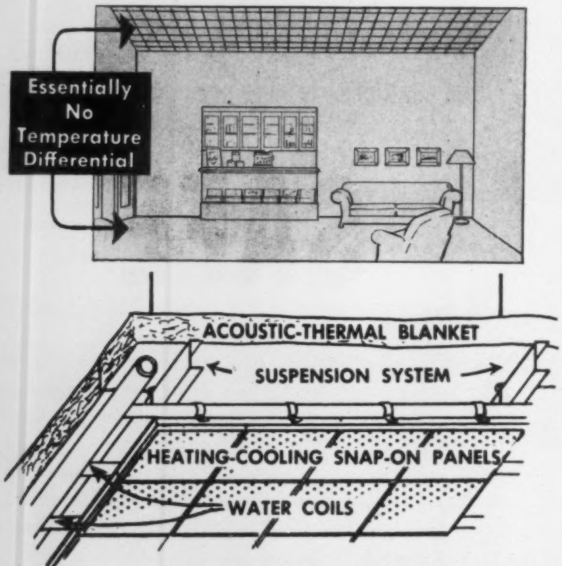
AFFILIATES: Conco Building Products, Inc. — Brick, Tile, Stone
Conco Materials Handling Division — Cranes, Hoists

How well informed
are you about the . . .

BURGESS-MANNING
3-Way Radiant Panel
Functional Ceiling?

Your clients will be asking!

Yes — word is getting around, as it will when something really good makes its appearance. Here is the most modern, efficient and economical method of heating, cooling and acoustic control ever devised — it's easy to layout, easy to install and competitive in cost. No other method can provide the same uniformity of temperature with essentially no differential from floor to ceiling. It has never been done before. The Burgess-Manning 3-Way Radiant Panel Functional Ceiling is completely self-contained — suspended construction and fully automatic. Know the facts and be prepared to recommend and specify the method that offers a new versatility and substantial savings in space, material and fuel.


Essentially No Temperature Differential
ACOUSTIC-THERMAL BLANKET
SUSPENSION SYSTEM
HEATING-COOLING SNAP-ON PANELS
WATER COILS

Write for Bulletin A-129-H

Architectural Products Division of
BURGESS-MANNING COMPANY
5970 Northwest Highway, Chicago 31, Ill.

Manufacturers of 3-Way Functional Ceilings
and Telephone Acousti-Booths

WHO'S WHAT

Continued

▶ *TYPHOON AIR CONDITIONING CO., INC.*—Robert J. Allen, district sales manager covering Maryland, Delaware, Virginia, District of Columbia, and parts of Pennsylvania and New Jersey; Henry Lesieur, district sales manager for Maine, New Hampshire, Vermont, Massachusetts, Connecticut, Rhode Island and parts of upper New York State.

▶ *BALTIMORE AIRCOIL CO., INC.*—Recent sales appointments and their territories are: Martin Eisenstein, eastern Pennsylvania, Delaware and southern New Jersey; James S. Adair, Louisiana and southern Mississippi; Tom Jones, Jr. of Sales Engineering Co., Georgia; William J. Donovan, Connecticut, western Massachusetts and Vermont; D. P. Mandery, Texas; E. W. Gifford, Wisconsin.

▶ *UNITED STATES AIR CONDITIONING CORP.*—Florida West Coast Distributors, Inc., distributors for the company's line of air conditioning, heating and ventilating products in that area.

▶ *SWARTWOUT CO.*—Robert E. Budde, Midwestern area regional product manager; James W. Krebs, a similar post in the Great Lakes area.

▶ *AIR CONDITIONING CORP. OF CONNECTICUT*—Manufacturers' representative for air conditioning and heating equipment in Bridgeport.

▶ *ACME INDUSTRIES, INC.*—Acme Industries of Southern California, covering the company's sales in that area. The new sales organization is headed by Charles C. Porter and John B. Macomber.

▶ *ROBERTSHAW-FULTON CONTROLS CO.*—H. J. Klug Co., sales representative for the company's Fielden Instrument Div. in Nebraska and western Iowa.

▶ *MINNEAPOLIS-HONEYWELL REGULATOR CO.*—Robert W. Cleveland, Pacific regional sales manager in the heating controls division; Gerald C. Cronau, a similar post in the southwestern region.

▶ *FEDDERS-QUIGAN CORP.*—Glenn E. Didcoct, district sales manager in the Birmingham area.

▶ *CONNOR ENGINEERING CORP.*—Frederic S. Bartlett and the John W. Joiner Co., handling the "Kno-Draft" diffuser line in southern New Jersey, eastern Pennsylvania, Delaware and Maryland, and the Ft. Worth areas, respectively.

▶ *COPELAND REFRIGERATION CORP.*—Hugh D. Smart, Chicago area sales representative.

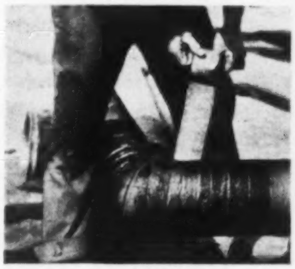
COMBAT CORROSION!

Specify

TAPECOAT®

. . . the Original Coal Tar Coating in Tape Form for Pipe, Pipe Joints, Couplings and Tanks

TAPECOAT is a coal tar coating with a tar-saturated close-woven fabric as a carrier for speed of application. The coal tar is self-bonding and requires no foreign adhesives.



Because coal tar is nature's own protection against corrosion, TAPECOAT resists moisture, acids, alkalis, soil stress, electrolysis, chemical fumes, fly ash, salt water, salt-laden air, barnacles, and other severe corrosive and abrasive conditions above and below ground.

TAPECOAT is clean to handle and easy to apply by spiral or "cigarette" wrapping with the use of a torch to bleed the coating to insure a continuous bond. It cuts maintenance and replacement costs.

TAPECOAT is sized to the job—comes in rolls of 2″, 3″, 4″, 6″, 18″ and 24″ widths to meet specific requirements on pipe, pipe joints, couplings, tanks, cable, conduit and other vulnerable steel surfaces.

PROVED IN SERVICE SINCE 1941

TAPECOAT has proved its dependability over the years in serving gas and oil companies, railroads, telephone companies, air lines, shipbuilders and operators, water and sewage works, chemical and industrial plants, engineers and contractors . . . providing continuing protection against corrosion.

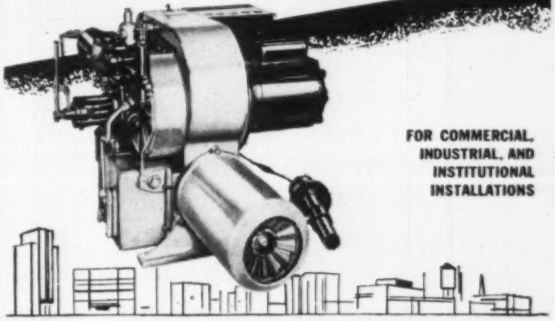
Write for descriptive brochure and prices.

The TAPECOAT Company

Originators of Coal Tar Tape Protection

1555 Lyons Street, Evanston, Illinois

Hev-E-Oil Burner keeps heat cheap!



FOR COMMERCIAL, INDUSTRIAL, AND INSTITUTIONAL INSTALLATIONS

Use heavy fuel oils *costing 30% less per gallon*

Cheap heat is smart economy! That's why thousands of owners are converting to Hev-E-Oil Burners and using *commercial* No. 4 or 5 heavy oils, costing 3 to 6¢ *less* per gallon than domestic light oils. Owners not only pocket the difference in cash, but get 7% more heat per gallon as well.

Hev-E-Oil Burners are specifically designed for heating buildings requiring more than 6,000 gallons of oil or 45 tons of coal per year.

Conversion is simple. The Hev-E-Oil fits all types of standard heating boilers and change-over takes only a few hours' time. Reports on file show fuel savings pay for conversion in a season or two.

QUICK FACTS ON HEV-E-OIL BURNER

- **Automatic, all-electric ignition**
- **Flame size set exactly to furnace capacity**
- **Low-pressure, air-atomizing, with large, non-clogging nozzle**
- **Six sizes: 1 to 60 gph**
- **Built-in low fire start**
- **As simple to install as a domestic burner**
- **Easy servicing and cleaning**
- **Air and oil metered to give high efficiency**

If you own, specify, install or service burners, get all the facts about Hev-E-Oil Burner — a *quality* product of America's leading manufacturer of self-contained boilers and oil-fired equipment. Write for illustrated Bulletin AD-102 NOW. CLEAVER-BROOKS COMPANY, Dept. F-381 E. Keefe Ave., Milwaukee, Wis.

Sales and Service In Principal Cities

Cleaver Brooks

HEV-E-OIL BURNERS ARE DESIGNED TO SAVE YOU MONEY

WHO'S WHAT

Continued

▶ *THE BABCOCK & WILCOX CO.*—F. T. Murphy, J. N. Rogers and C. J. Ponsot, sales for the tubular products division in the St. Louis area. The former sales offices of Globe Steel Tubes Co. in Houston, Cleveland and Detroit have been consolidated with B&W's sales offices in those cities. Globe Steel Tubes has been purchased by Babcock & Wilcox.

▶ *AMERICAN AIR FILTER CO., INC.*—Cyril DiMercurio, head of the company's new branch office in Denver.

▶ *REFLECTAL CORP.*—Richard H. Sabel, western sales manager. Reflectal is a subsidiary of Borg-Warner Corp.

▶ *PRAT-DANIEL CORP.*—Francis C. Hayes, distributor in New York, Westchester and Long Island for the company's line of industrial heating equipment.

▶ *D. J. MURRAY MFG. CO.*—Brownlee-Morrow Engineering Co., distributor for "Grid" unit heaters in Alabama and parts of Florida.

▶ *RAWLPLUG CO., INC.*—J. P. Eichorn, northern California representative.

▶ *GENERAL ELECTRIC CO.*—Wylie Plumbing & Heating Co., distributor for packaged air conditioners in the Baltimore area.

▶ *CLEAVER-BROOKS CO.*—Ruffridge-Johnson Equipment, Inc., eastern Minnesota and parts of northwest Wisconsin.

▶ *GAINES-COLLINS*—Representatives and their territories are: John Phillip Schoenfeld, Virginia, northern North Carolina, Washington, lower Delaware, Maryland; Bert Lewyn, Georgia, South Carolina, eastern Tennessee; George E. Christopher, eastern Colorado, western Nebraska, southwestern South Dakota, eastern Wyoming.

▶ *ZATKO METAL PRODUCTS, INC.*—Harold Winningham & Co., distributor covering Washington, Oregon, northwest Idaho, Montana, northwest Canada, Alaska.

▶ *GRAVER WATER CONDITIONING CO.*—Frontier Engineering Services Co., distributor for Utah, northwestern Wyoming, most of Nevada.

▶ *JOHNSON SERVICE CO.*—New branch offices opened at Akron, Mobile, New Haven, Sacramento, Tampa, Wilkes-Barre, Youngstown, and Springfield, Mass.

National Champion

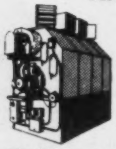
DELIVERS THE KNOCKOUT PUNCH!

. . . to heating problems. If you're on the ropes with a heating need—space heating, tempering, make-up air, curing, drying or de-icing—there's a National Champion Heater to do the job. Check these winning points:

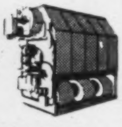
- 80% guaranteed heating efficiency
- Direct fired for gas, oil or combination fuels
- Completely automatic controls — for constant, clean heat
- 70%-150% more heat transfer area than similar units
- Quieter, smoother operation — lowest blower RPM
- Highest available external static pressures
- Electronic flame failure control
- Completely wired, assembled and flame-tested at the factory to guarantee peak performance
- Listing by Underwriters' Laboratories, Inc.

Teardrop design
Combustion Chamber
the "heart" of National
Champions

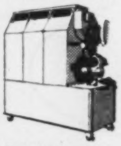
NATIONAL CHAMPION HEATERS—6 Models — 66 Sizes



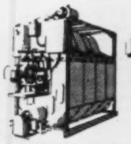
Model H—vertical unit with discharge heads. 12 sizes.



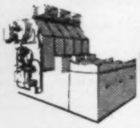
Model D—vertical unit for duct work. 12 sizes.



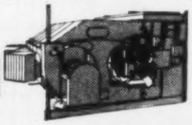
Model P—portable, vertical unit for flexible duty. 6 sizes.



Model R—inverted unit with discharge heads at bottom. 12 sizes.



Model S—vertical unit with side blowers to permit proper location of air mixing dampers. 12 sizes.



Model C—horizontal ceiling suspension unit for space saving. 12 sizes.

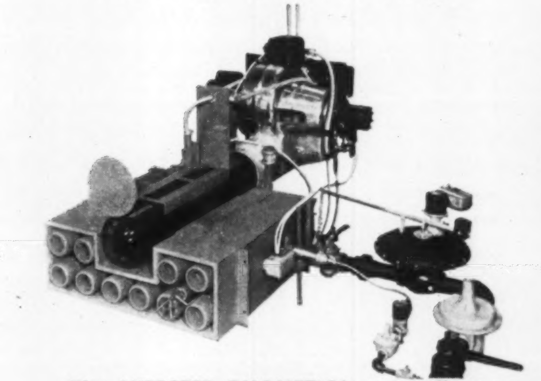
200,000 to 2,000,000 BTU CAPACITIES

Write today for complete information and specifications.

NATIONAL HEATER COMPANY, INC.
2180 Cleora Avenue, St. Paul 4, Minnesota

WEBSTER DUONETIC*

for Dual Fuel Firing



The WEBSTER DUONETIC* now offers unsurpassed economy, efficiency and trouble-free operation in the combination oil and gas firing equipment field. Never before have both fuels been burned so well so simply.

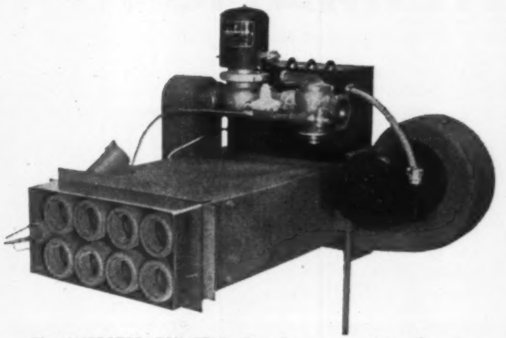
You can rely on the usual WEBSTER quality to provide you with the best.

Both burners employ electric ignition; constant electric ignition on the oil burner, and electric ignition for the gas burner safety pilot.

WEBSTER DYNETIC*

Forced Draft

GAS BURNER



The WEBSTER DYNETIC Gas Burner consists of multiple venturi tubes with heat resistant alloy, flame retention nozzles assembled in a metal housing and equipped with an electrically driven blower to furnish all of the air for combustion.

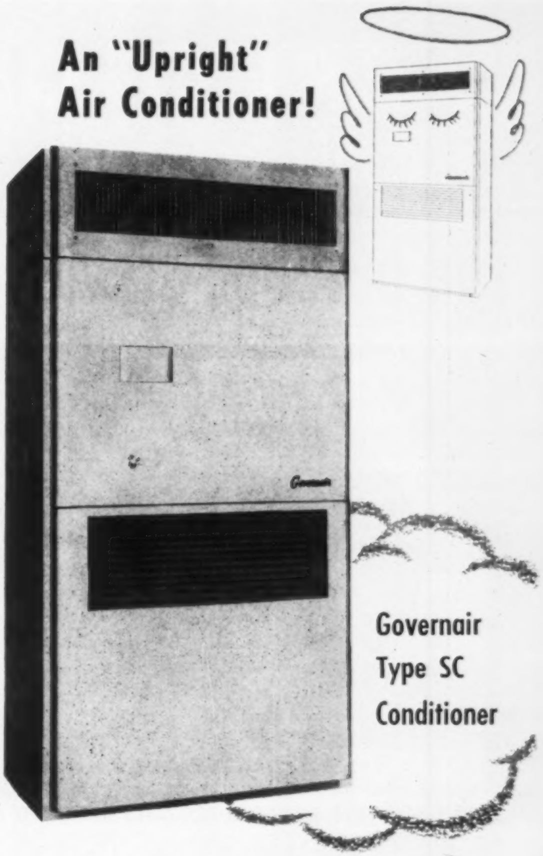
All of the valves and controls required for safe, automatic operation, except for thermostat and limit controls, are incorporated in the assembly and wired and tested at the factory. The motor driving the blower is equipped with a centrifugal switch to prevent main gas valve operation unless the blower is functioning.

The burner is now available in 13 sizes for natural gas up to and including 300 h.p.

*TRADEMARK

The WEBSTER ENGINEERING COMPANY
TULSA, OKLAHOMA
Division of SURFACE COMBUSTION CORPORATION, Toledo, Ohio

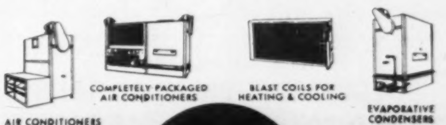
An "Upright" Air Conditioner!



Yes, this is an *upright* Governair self-contained conditioner—but that's not the reason for the halo.

The halo is there because this air conditioner behaves itself! Built to perform true air conditioning quietly and efficiently . . . it does just that! Flexibility, compact design, easy installation, dependability and economy are among its many virtues.

Available in capacities from 3 to 15 tons, the Governair Type SC Conditioner is the answer to your air conditioning needs in commerce, institutions, factories and homes. Choose *Governair* . . . originators* of completely packaged air conditioners!


AIR CONDITIONERS
COMPLETELY PACKAGED AIR CONDITIONERS
BLAST COILS FOR HEATING & COOLING
EVAPORATIVE CONDENSERS

GOVERNAIR

*Type SCU Conditioners Patent No. 2,297,928
GOVERNAIR CORPORATION • 513 N. Blackwelder • Oklahoma City, Okla.

MERCOID
PRESSURE CONTROLS

FOR OUTDOOR SERVICE

MERCOID
CONTROL

HERE'S ANOTHER MERCOID PRODUCT DESIGNED TO OUTPERFORM AND OUTLAST ORDINARY TYPES OF PRESSURE CONTROLS.

Conforms to Nema specifications 1A (semi-dust tight), 2 (drip tight), 3 (weather resistant, weather proof, splash proof, sleet proof, moisture resistant and rain tight), 4 water tight (hose test).

The case and cover are zinc plated steel having a coating that will withstand a 50-hour salt spray test. The cover provides for visible inspection of the sealed Mercoid mercury contact and the calibrated dial. Adjustments are external. Electrical connection is made by means of a ½-inch tapered pipe protruding back of control case.

IT'S AVAILABLE IN
17 DIFFERENT PRESSURE RANGES
FROM 0-30" VAC. TO 300-2500 P.S.I.
WITH THE SENSITIVITY YOUR APPLICATION REQUIRES
WRITE FOR BULLETIN 14 PW

THE MERCOID CORPORATION
4201 BELMONT AVE., CHICAGO 41, ILLINOIS
New York: 205 E. 42nd Street • Philadelphia: 3137 N. Broad Street

WE HEAR THAT . . .

- The merger of *UNITED STATES RADIATOR CORP.* and *THE NATIONAL RADIATOR CO.* became effective April 1, according to an announcement from *T. B. FOCKE*, president. The new name of the company is *NATIONAL—U.S. RADIATOR CORP.*

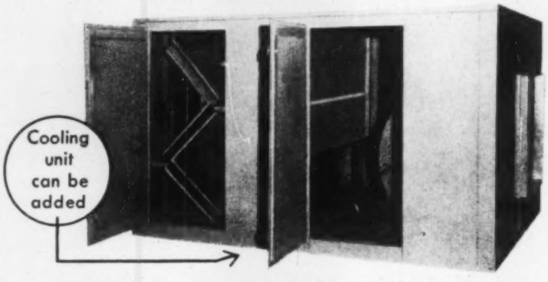
- *MINNEAPOLIS-HONEYWELL REGULATOR CO.* has announced plans for the construction of a new factory building in Chicago at an estimated cost of $1,750,000.

- *WALWORTH CO.* has entered into an exclusive manufacturing arrangement with *GENERAL AMERICAN TRANSPORTATION CO.* to produce for Walworth rigid PVC plastic pipe fittings and valves in its East Chicago, Ind. plant.

- *ARMCO STEEL CORP.* is planning a $60 million expansion and improvement program, according to *W. W. SEBALD*, Armco president.

- *SEELYE STEVENSON VALUE & KNECHT*, consulting engineers of New York City, have announced the admission to partnership of *GILBERT D. FISH, A. ROGER KELLY, ERIK B. J. ROOS, STEPHEN D.*

The new
KLIMATIC KING
a compact heating, ventilating unit
Ideal for applications where high humidity is a problem



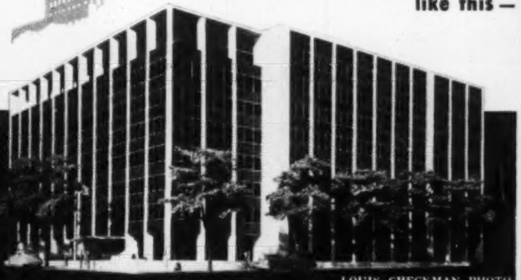
Designed for dairy, food processing and industrial plants. The Klimatic King is fabricated with a corrosion-resistant galvanized steel casing, insulated to eliminate condensation and dripping. Automatic controls for temperature and ventilation. Two speed motor for "high" and "low" production periods, provides maximum economy of operation. These and many other features are standard with the Klimatic King, not "optional extras". The quality leader in its field. Sizes 3,500 to 20,000 CFM.

Architect and dealer inquiries invited. More than fifty years experience is at your disposal. Write today

THE King CO. OF OWATONNA
NORTH WINONA ST. OWATONNA, MINNESOTA
MANUFACTURERS OF SHARP FREEZE, COOLING, VENTILATING AND HEATING SYSTEMS

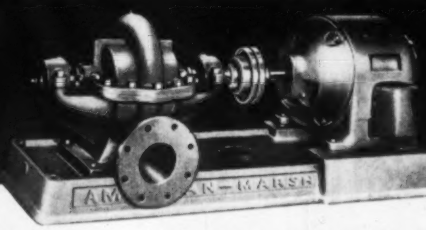
Handle HIGH STATIC HEADS with greatest EFFICIENCY!

— in skyscrapers or buildings like this —



LOUIS CHECKMAN PHOTO

with American-Marsh TYPE HLM-HIM Split-case Centrifugal Pumps



To insure years of efficient pumping service in the beautiful new NEA Educational Center, Washington architects *Joseph H. Saunders, A.I.A.,* selected *four* Type HLM-HIM American-Marsh Pumps.

In skyscrapers too, they're often installed because they're *properly designed and built* to handle *extremely high static heads.*

Such quality features as purge-type grease lubrication, heavy-section casings and extra-deep stuffing boxes recommend them to you. But get *all* the details . . .

AMERICAN-MARSH
Centrifugal
PUMPS

WRITE for new HLM-HIM Bulletin 350 with cutaway views and performance data!

Pumps and Pumps only Since 1873

AMERICAN-MARSH PUMPS

BATTLE CREEK MICHIGAN

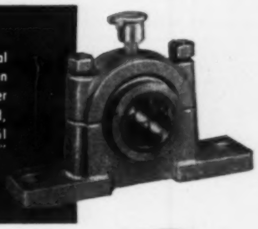
In Canada:
American-Marsh Pumps (Canada) Ltd., Stratford, Ont.

CENTRIFUGAL, TURBINE, STEAM AND POWER PUMPS FOR TESTING, PROCESSING, BOILER FEED, FIRE PROTECTION, ETC

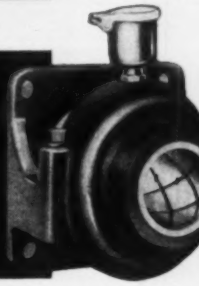
THERE'S A Randall PILLOW BLOCK AND BALL ASSEMBLY FOR EVERY TYPE APPLICATION

The unique Randall ball assembly is in its several different styles, a basic part of every Randall Pillow Block. It features the exclusive Randall "deep well" reservoir with controlled double lubricated graphited bushing. It is readily adapted to a variety of different housings and may be purchased separately.

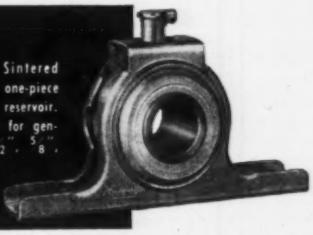
NORMAL DUTY PILLOW BLOCK. A general service pillow block for normal duty on small shafts and for heavier duty on larger shaft sizes. Double lubricated with graphited, phospor bronze bushing in wool packed oil reservoir housing. For shafts $\frac{1}{2}$" to $3\frac{15}{16}$" inclusive.



FLANGE OR SIDE MOUNT PILLOW BLOCK. A Top quality pillow block for the most exacting service. Double lubricated with graphited phospor bronze bushing in wool packed oil reservoir housing. Widely used in air moving equipment, conveyors, and agricultural equipment. Side mounting only. For shafts $\frac{1}{2}$" to $1\frac{15}{16}$" inclusive. Other light and normal duty flange units available in three and four bolt styles.



SINTERED BUSHING SERIES. Sintered bronze bushings in streamline one-piece steel housings. Wool packed oil reservoir. Mounts in any position. Excellent for general service on smaller shafts $\frac{1}{2}$", $\frac{5}{8}$", $\frac{3}{4}$", $\frac{15}{16}$", and 1".



Ask your area distributor for more complete information and prices on Randall Pillow Blocks. The most complete line available anywhere.

BRONZE BAR STOCK
BRONZE BUSHINGS
PILLOW BLOCKS
SHEET LUBRICATOR

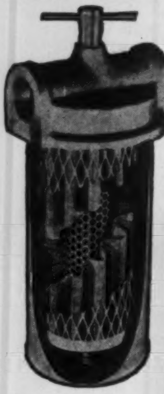
Randall

GRAPHITED BEARINGS
THRUST WASHERS
SAFETY COLLARS
BRONZE CASTING

RANDALL GRAPHITE BEARINGS, INC.

1012 S. Greenlawn Ave., Lima, Ohio

WATER FILTERS



All of the outstanding qualities that have made MARVEL SYNCLINAL FILTERS the overwhelming choice in the filtration of hydraulic oils and other oil base liquids have been adapted to provide the same efficiency in the filtration of water.

Balanced Synclinal Design means longer periods of efficient filtration and productive operation.

STURDY CONSTRUCTION

to withstand use under rugged conditions, yet simple enough to allow any workman to easily disassemble, clean and reassemble on the spot, in a matter of minutes.

A SIZE FOR EVERY NEED

Available in line and sump type units in capacities from 5 to 100 G.P.M. Permanent type Monel metal insert ranging in mesh sizes from coarse 30 to fine 200.

Complete data and further information are contained in WATER CATALOG #300.

Write for your copy

LINE TYPE (Cutaway)

IMMEDIATE DELIVERY!

Marvel not only delivers a top grade filter in both quality and performance, but DELIVERS IMMEDIATELY. If desired, shipments are made on same day orders are received.

SUMP TYPE (Cutaway)

MARVEL Engineering Company

627 W. Jackson Blvd., Chicago 6, Ill.
PHONE: Franklin 2-4431

WE HEAR THAT

Continued

TEETOR, and *HAROLD S. WOODWARD*. All have been with the firm for many years.

▶ The *WORCESTER REED WARNER MEDAL*, given for outstanding contributions to permanent engineering literature, has been awarded to *HOWARD S. BEAN* of the *NATIONAL BUREAU OF STANDARDS*. The award was in recognition of his work in the field of fluid metering and his preparation of publications on the subject.

▶ Production is underway on two new aluminum welding tube mills at the *ALUMINUM CO. OF AMERICA* works at Alcoa, Tenn. The mills will provide Alcoa with the capacity to produce welded aluminum tube from ½ to 8 in. in diameter.

▶ *BARRY CORP.* has announced that, in keeping with its expanding product line, it has changed its name to a more descriptive title, *BARRY CONTROLS, INC.*

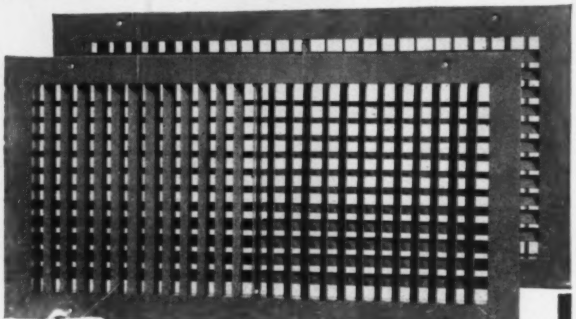
▶ *PEERLESS ELECTRIC CO.* broke ground last month for a $350,000 plant to house its fan and blower division. The building is part of a half-million dollar expansion program.

See This Sensational New Heating & Ventilating

GRILLE WITH DETACHABLE VOLUME CONTROL!

- Increased Directional Control
- Eliminates Possibility of Tampering or Accidental Changes
- Meters Air-flow Accurately

A-J



New features never before available . . . increased directional control, tamper-proof regulating, unmatched beauty, rugged strength and extreme ease of installation.
Extruded aluminum vanes are individually adjustable. Their unique shape provides greater directional control, and reduces air resistance to a minimum. This means more accurate balancing.
Each vane individually controlled. Operates under spring-loaded tension, eliminating any possibility of deflection pattern being altered by accident or tampering.
Fully-enclosed, wrap-around frame makes grille sturdier, assures easier, safer installation. Entire mechanism is concealed eliminating possibility of "air leaks".
Series "400" A-J Grilles (with — or without volume control) available in any size. Choice of vertical or horizontal louvers only — or combination of both, with either louver in front. Both sets of louvers adjustable without removing grille. Available in prime coat, hammered bronze or metallic gray or any standard finish.

For More Information — Call or Write

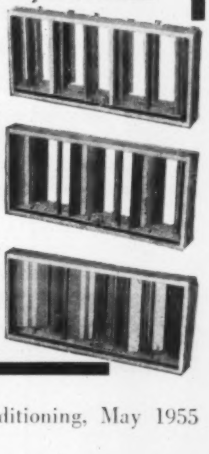
A-J MANUFACTURING CO.

2119 Washington St. Dept. H-5 Kansas City 8, Mo.

Matching Return Air Grilles Available

NEW DETACHABLE VOLUME CONTROL

Easy to operate. Accurately meters air-flow from a "Whisper" to a "Full Blast"! A volume control you can depend on! Meters the flow accurately at *every stage* — from fully closed to fully open. No "dead spots". Louvers move simultaneously in opposing directions. Gear-driven action. System may be balanced without removing outer grille. Available with grille, or can be quickly installed later.



SAVE TIME and MONEY

when you form

FLEXIBLE CONNECTORS

use "engineer approved"

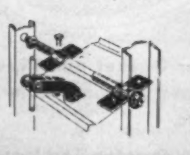
ELGEN SILENT DUCT

*Pats. Pend.

Imagine, this one-piece, factory-assembled metal-to-material unit unrolls absolutely *flat!* No more bothering with unwieldy duct material that buckles easily. Elgen Silent Duct makes on-the-spot work a cinch . . . you just measure and cut. You can fabricate *any type* of flexible duct connector in minutes . . . with half the effort! You can save up to 60%! No more worry about an inventory of "made-up" parts, either. Your choice of U.L. approved, (Gov't. Spec. Mil-D-10860) canvas, Johns-Manville asbestos and U. S. Rubber neoprene coated fibre glass, in 3" or 6" widths attached to 24 or 26 gauge galvanized steel or 24 gauge aluminum to fill every job requirement. All available in handy-to-use 25, 50 or 100 foot rolls.

2 More Elgen Products That Put Profits In Your Pocket!

ELGEN ALL-TITE VANE RUNNER
- Quickest and easiest way ever devised for installing turning vanes for square elbows
- No special tools required; vanes lock easily with blow of hammer



ELGEN DAMPERSET
For Multi-Blade Dampers . . . Parallel or Opposed
- Most perfect damper hardware developed
- Assembles in a jiffy . . . cuts assembly time in half
- Easily adjusted and self-aligning.

Licensed by Minneapolis-Honeywell

ELGEN PRODUCTS ARE SOLD THROUGH LEADING JOBBERS EVERYWHERE.

"Put Profits In Your Pocket!"

Write today for free catalog and "spec" sheet! Dept. E5

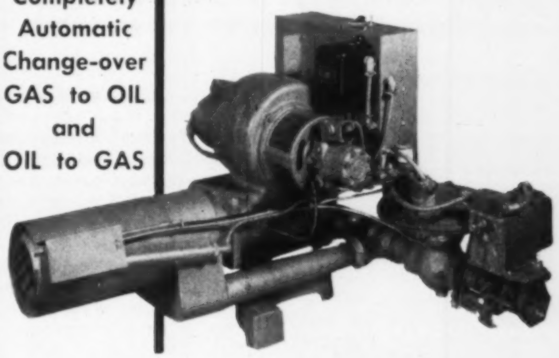
ELGEN MANUFACTURING CORP. 41-34 39 Street,
Long Island City, N. Y

NEED STANDBY?

A COMBINATION GAS OIL BURNER

WITH AUTOMATIC CHANGE-OVER

Completely
Automatic
Change-over
GAS to OIL
and
OIL to GAS



Roberts-Gordon has done it again!

A completely automatic combination gas-oil burner — in three sizes! Oil capacity . . . 2½ gal. to 30 gal. . . . and available with modulating gas input . . . and 2-stage oil input.

It's compact — completely assembled and factory wired . . . and furnished with plug-in electronic controls for simple servicing!

Other ROBERTS-GORDON Industrial and Commercial Burners for Complete Heating and Processing . . .

MULTURI (Multiple Venturi) Burners
NORDENSSON POWER Burners

Write or phone for literature and details . . .

GAS HEATING EQUIPMENT
ROBERTS-GORDON
DEPT. HPAC BUFFALO 6, N. Y.
FURNACES BOILERS
UNIT HEATERS CONVERSION GAS BURNERS

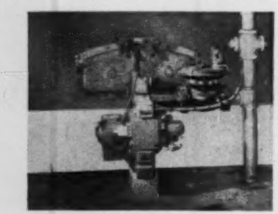
Why shop around?

Power-Flame

HAS THEM ALL-

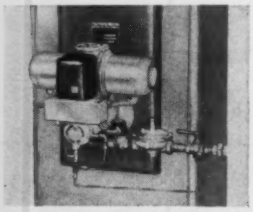
A BURNER UNIT TO FIT EVERY APPLICATION!

Regardless of application . . . commercial, industrial or domestic . . . there's a POWER-FLAME BURNER engineered to give *superior performance more economically*



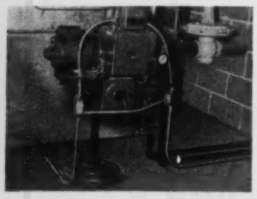
A box manufacturer in Pittsburg required continuous low cost steam. Of course he chose this compact Power-Flame Burner.

BFG Series—Outstanding in the industry, with these advanced features: factory wired-controls and valves mounted . . . wired sequencing panel provides purge period for utmost safety . . . positive control of air for combustion. 8 easy-to-install models in capacities from 450,000 BTU to 9,000,000 BTU input. Large capacities for heating or power processing.



Another example of an oil fired furnace converted to gas with Power-Flame.

FG Series—POWER-FLAME'S answer to the homeowner. An inexpensive replacement of oil burner for the small or large home or small industrial application. 3 gun type units . . . Model FG 175 capacity to 175,000 BTU, AGA listed; Model FG 330, capacity to 330,000 BTU, AGA listed; Model FG 500, capacity to 500,000.



A single compact unit firing both gas and oil. A clothing store in Missouri elected the Power-Flame FGO 3500 for uninterrupted heating service.

FGO Series—POWER COMBIMATIC gas-oil—6 models—for gas and light oil in capacities to 3,500,000 BTU input. Features include . . . automatic ignition for both fuels . . . automatic air adjustment . . . electronic safeguard . . . factory assembled and tested for both gas and oil. Automatic or manual changeover optional.

A Power-Flame Dealership can be valuable; write today for complete information

Power-Flame BURNER

A Division of
Siemon Manufacturing Company • Grandview, Mo.

WE HEAR THAT

Continued

▶ *PITTSBURGH CORNING CORP* has announced a $1,500,000 expansion program scheduled for completion by midyear. As the first step, production of "Foamglas," the cellular glass insulation, will be increased by 25 percent. Plans include installation of a new production line at the company's Sedalia, Mo. plant and the construction of a 50,000 sq ft warehouse.

▶ *JOSEPH T. RYERSON & SON, INC.* has acquired the plant and stocks of *ARTHUR C. HARVEY CO.*, Boston steel and aluminum distributor. Ryerson plans to consolidate its greater Boston operations at the Harvey plant.

▶ *FRANK P. GIBBONS*, for the past 14 years general sales manager of *VIKING AIR CONDITIONING*, is climaxing 20 years of selling to the heating and air conditioning industry by opening his own office in Lakewood, Ohio as manufacturers' representative to the trade.

▶ *LIMA ELECTRIC MOTOR CO.* is expanding its main manufacturing plant at Lima, Ohio and increasing its production facilities there.

Send for your **FREE SAMPLE** *today!*

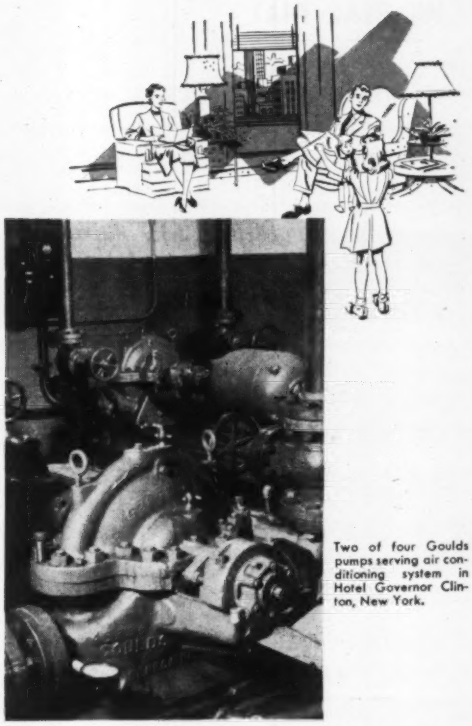
KEY-TITE
WATER PROOF
PIPE JOINT
COMPOUND

The Perfect Sealer for Gasket and Pipe Joint Connections on All Lines Carrying Water, Gas, Low-Pressure Steam, etc.

Key-Tite seals positively, yet is easily opened—will not freeze in the joints. Order your free sample now and try it on your next joint sealing job. You'll understand why it has been a favorite for over 30 years among plant maintenance men, heating contractors and others concerned with efficient and fast pipeline assembly.

KEY COMPANY

2617 McCasland • East St. Louis, Illinois



Two of four Goulds pumps serving air conditioning system in Hotel Governor Clinton, New York.

These pumps insure cool comfort for

Governor Clinton's guests

With 1,200 rooms to air condition, New York's Hotel Governor Clinton needs pumps it can depend on.

That's why the hotel's management selected Goulds pumps for their new air conditioning system. They knew the Goulds reputation for efficient operation and long, trouble-free service.

Three 2½" Goulds Fig. 3480 pumps handle this day-and-night assignment. Each has a capacity of 300 GPM under a 90-ft. head, and circulates water to the 200-ton cooling tower on the 29th floor. A smaller Goulds Fig. 3460 pump with a 90 GPM capacity handles the pumping job during low-load periods.

You, too, can insure efficient operation, and years of uninterrupted service, by specifying Goulds pumps for your air conditioning installations. There are models and sizes for every requirement.

Your Goulds representative will welcome an opportunity to help you select the right pumps to suit your needs. Or write directly to our home office in Seneca Falls. Your inquiry will receive prompt attention.

MEMBER

Goulds PUMPS INC.
Seneca Falls
New York

Atlanta • Boston • Chicago • Houston • New York • Philadelphia • Pittsburg • Tulsa

There are

21 BASIC INDUSTRIES

and

HENDRICK

Serves Them ALL!

That's right! Hendrick serves every one of the 21 basic industries designated by the U. S. Department of Commerce under its Standard Industrial Classification list. If you have a perforating problem and are not already familiar with Hendrick's facilities, we stand ready to serve you, too!

Whatever your needs be, if you wish to perforate metal, rubber, plastic or masonite for a screening, straining, decorative, display or acoustical application, Hendrick's long experience can be of real help. Join the long list of manufacturers who now derive untold assembling and selling benefits by using Hendrick Perforated Metal as a fabrication material. Call Hendrick today.

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MANUFACTURING COMPANY
48 DUNDAFF ST., CARBONDALE, PA. • *Sales Offices in Principal Cities*
Perforated Metal • Perforated Metal Screens • Wedge-Slot Screens • Architectural Grilles • Mitco Open Steel Flooring • Shur-Site Treads • Armorgrids

the **FINAL ANSWER**
for air conditioning
in modular ceilings...

WIREMOLD FLEXIBLE AIR DUCT

Wiremold Flexible Air Duct completes the flexibility of modular acoustical ceilings, making it possible to relocate diffusers without moving permanent duct work. Air distribution of entire areas can be rearranged quickly and easily to meet changing requirements in floor layout and partitioning.

Air Duct's extreme flexibility for connecting air diffusers with branch ducts allows the widest possible range for offsetting diffusers from ducts. It not only saves time and money on installation, but continues to save maintenance expense every time a diffuser is relocated, long after the initial installation. Maintenance crews make changes easily and quickly, without difficult removal and reinstallation of permanent ductwork.

Here is the ideal solution to ducting problems in cramped quarters. It is lightweight, sturdy, takes sharp bends easily, and greatly reduces installation time. New installations or remodeling projects become easier for architect and contractor when Wiremold Flexible Air Duct is used for connections.

For complete information
Write Dept. F-5

The WIREMOLD Company
Hartford 10, Connecticut

WE HEAR THAT

Continued

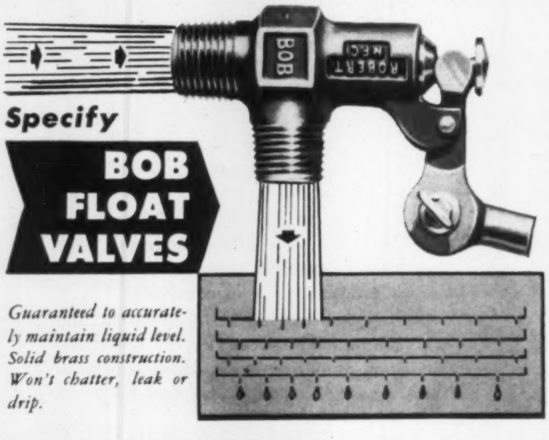
▶ *AIRTEMP DIV., CHRYSLER CORP.* announces the formation of a new application engineering and sales training department. Activities of the department will be under supervision of *R. A. GONZALEZ*, director. Airtemp's sales efforts have resulted in the publication of its *Publicity Kit for Airtemp Distributors and Dealers*, a 24 page brochure.

▶ *SUPERIOR COMBUSTION INDUSTRIES, INC.* recently announced that a new plant is under construction in Wilkes-Barre. Designed for the production of packaged steam generators, it is expected to be in operation this month.

▶ *E. I. du PONT de NEMOURS & CO.* announces that construction is underway on a half-million dollar laboratory for research into "Freon" fluorinated hydrocarbon compounds and their applications to industry. Completion is scheduled for early 1956.

▶ *MUELLER BRASS CO.* has opened a new warehouse to serve the St. Louis area. The building contains over 11,800 sq ft of floor space to service customers in Missouri, Illinois, Tennessee, Kentucky and Arkansas.

The Standard Valve
For COOLING TOWER applications...



Specify

BOB FLOAT VALVES

Guaranteed to accurately maintain liquid level. Solid brass construction. Won't chatter, leak or drip.

Standard equipment for Major COOLING TOWER manufacturers and piping fabricators for POSITIVE-ACTION and unsurpassed performance under the toughest service conditions. Take advantage of the savings thru standardization *—one source for completeness of line—smaller and more flexible inventory—preventive maintenance—safety—durability—interchangeability—increase of sales—customer satisfaction and* ECONOMY.

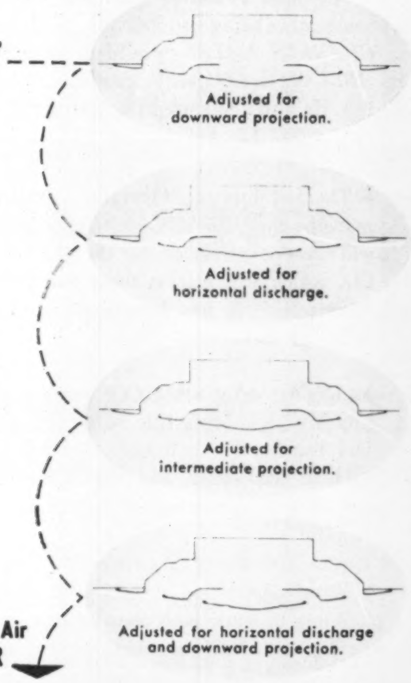
Competitively priced and available in sizes from ⅜" to 1½". Write for details of complete line.

ROBERT Manufacturing Company
9035 Venice Boulevard, Los Angeles 34, California

Take a look at a

TRULY ADJUSTABLE

Diffuser


Adjusted for downward projection.
Adjusted for horizontal discharge.
Adjusted for intermediate projection.
Adjusted for horizontal discharge and downward projection.

You Get Better Air with AGITAIR

AGITAIR®

TYPE "OA"

Here's a distinctively different diffuser with a radically new means of controlling air direction at four different angles of discharge simultaneously. *Without changing the position of the spinnings,* AGITAIR "OA" diffusers can be adjusted to put the air where you want it in one, two, three or four directions . . . *after installation.* Result: Segmentized . . . positive adjustability with Finger-Tip Air Direction Control.

Write for Bulletin C-101

Contains complete data, performance charts, construction details, etc.

AIR DEVICES INC.

185 MADISON AVENUE, NEW YORK 16, N. Y.

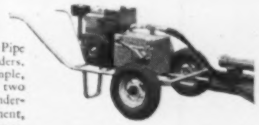
AIR DIFFUSERS • FILTERS • EXHAUSTERS

CUT COSTS ON UNDERGROUND PIPING INSTALLATIONS WITH GREENLEE PUSHER

Save hours of time, cut job costs with this quick, easy way of installing underground pipe. With a GREENLEE Hydraulic Pipe Pusher, *one man* pushes pipe *under* streets, walks, tracks, lawns, floors, and other obstacles. No costly tearing up of paving . . . eliminates extensive ditching, as just a short trench accommodates the Pusher. No tedious tunneling, backfilling, tamping, repaving. Compact, portable, powerful. Often pays for itself on first few jobs. Thousands in use for big savings of time and labor. Two models: one for ¾ to 4″ pipe, one for larger pipe, concrete sewer pipe, drainage ducts. Write for facts today.

POWER PUMP

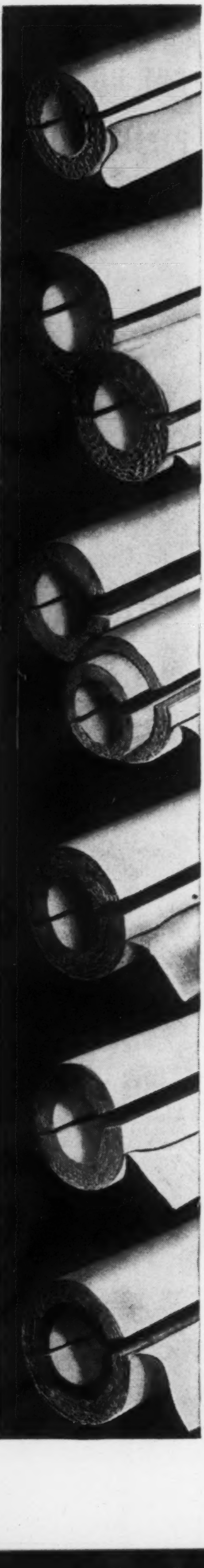
For all models of GREENLEE Pipe Pushers and Hydraulic Pipe Benders. Makes the toughest pushing jobs simple, fast. Average pushing performance: two feet per minute. Rubber-wheeled undercarriage, available as extra equipment, provides convenient, easy way to transport and move about on job location.



TOOLS FOR CRAFTSMEN

GREENLEE

Greenlee timesaving tools for plumbing and heating work: Hydraulic Pipe Pushers • Hydraulic Pipe Benders • Tubing Benders • Pipe Bits Auger Bits • Spiral Screw Drivers • Chisels • And many more
Greenlee Tool Co., 2345 Twelfth Street, Rockford, Illinois



For

HIGHEST QUALITY

in

LOW-PRESSURE

PIPE COVERINGS . . .

be sure to

specify–

SalMo

Prompt service at all times on a complete line of pipe insulation for hot, cold and chilled water and steam lines.

Your inquiries will receive our prompt attention.

SALL MOUNTAIN
COMPANY
HAMILTON, OHIO

WE HEAR THAT

Continued

▶ "Additional new plant and production facilities will be put into operation this year and new items are constantly being added the U-Brand line," said *CHARLES KATES*, president of *UNION MALLEABLE MFG. CO.*, at the company's annual sales meeting. He also announced the opening of new warehouse facilities in Los Angeles, San Francisco and Denver.

▶ The full line of "Fiberglas" industrial insulations made by the *OWENS-CORNING FIBERGLAS CORP.* will also be produced for the *ARMSTRONG CORK CO.* which will market them under the trade name, "Armaglas," it has been announced jointly by officials of both companies.

▶ *AMERICAN BRASS CO.* will soon begin construction of a new brass mill in the Paramount district of Los Angeles. The mill and office will require 330,000 sq ft of floor space, and, together with the land, will involve an expenditure of $13 million, the company reports.

▶ With construction already well under way, the new building to house both plant and general offices of the *F. W. DWYER CO.* is scheduled for completion in July.

SPRAYING SYSTEMS

SPRAYING SYSTEMS CO.

SPRAY NOZZLES

performance-proved for every operation

Take advantage of the wide choice of spray nozzle types and capacities supplied by Spraying Systems to meet your needs exactly. Actually tens of thousands of precision, standard spray nozzles to choose from. Every kind of spray pattern.

STRAINERS . . . high efficiency line strainers in all standard capacities.

write for catalog 24

A complete 48 page catalog with specifications on all standard and pneumatic atomizing nozzles. The most complete spray nozzle reference manual ever printed.

SPRAYING SYSTEMS CO.
3219 Randolph Street • Bellwood, Illinois

Shhhhh . . .

COMPLETE *SILENCE*
FOR YOUR ENTIRE
PIPING SYSTEM
WITH A

MILLER *STREAMFLOW* CHECK VALVE

CENTER GUIDED • SHOCK PROOF • ELIMINATES WATER HAMMER
ENTIRELY *NOISELESS* • FULL RADIAL FLOW
Certified Minimum Pressure Loss Curves Available • Sizes 1" through 24" Flanged • ASA Drilling • IBBM • Cast Steel • All Alloys

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AGENTS IN PRINCIPAL CITIES

MILLER VALVE CO. INC.

P.O. BOX 1255 — PITTSBURGH 30, PA.
PLANT — 1620 PENNSYLANIA AVE.

- **Highest Thermal Efficiency**
- **Minimum Pressure Loss**
- **Positive Oil Return with Vapor**
- **Most Efficient Heat Transfer**
- **Assures Turbulent Fluid Flow**

Yula
FREON COOLERS

For use in Air Conditioning, Refrigeration, Industrial and Process Cooling, using water and other fluids. Refrigerant passes through Tube Side and is vaporized. Fluid being cooled passes thru Shell Side which is baffled.

Investigate Yula before you order

Other Yula Products

- **Converters**
- **Instantaneous Heaters**
- **Condensate Coolers**
- **Yula-trol Fuel Oil Detector & YT Heater**
- **Mixing Valves**
- **Other Types of Fuel Oil Heaters**
- **All Types of Special Heat Exchangers**

Dry Expansion Type
Ask for Catalog FC-10

A.S.M.E. CONSTRUCTION

YULA WATER HEATERS, INC.
NEW YORK, NEW YORK

That's right
LOOK AGAIN

ALL TRAPS are NOT ALIKE

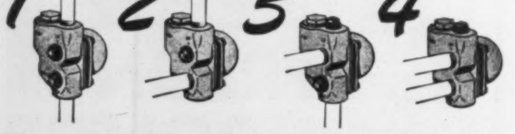
here's why the
THERMOSTAT *in*
***Sterlco®* TRAPS**
does more for you...

1. It compensates for changes — operates satisfactorily even if pressures vary.
2. It cannot be damaged by excessive steam pressures or by freezing.
3. If the bellows is damaged, the spring action closes the valve. Trouble is immediately located because unit or radiator becomes cold — no waste of steam — no searching. Thermal element easily replaced.

The ¾" 69B FLOAT and THERMOSTATIC TRAP

Ideal for installation and rehabilitation of unit heaters. Dependable, compact, large capacity, easy servicing and rugged construction makes 69B an outstanding performer on unit heaters and other steam heating equipment.

***Install* the most convenient Way**



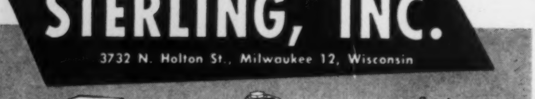
The ½" 7—50A ANGLE RADIATOR TRAP

Keep radiators clear of condensate without wasting steam. Sturdy bronze bodies and covers—replaceable seats. Angle, Straightway, Corner or Vertical styles.

STEAM HEATING is MODERN, EFFICIENT and DEPENDABLE.

Sterlco Products Distributed through
LEADING HEATING and PLUMBING WHOLESALERS

STERLING, INC.
3732 N. Holton St., Milwaukee 12, Wisconsin



MEETINGS & CONVENTIONS

MAY 10-13—*Heating, Piping and Air Conditioning Contractors National Association*, 66th annual meeting. Shamrock Hotel, Houston. Committee reports will be given on progress and performance in the past year in air conditioning, refrigeration, welding, radiant panel heating, boiler output. Special talks will be presented on selling and labor's role in the industry. Panels on pipe welding and plastic pipe are scheduled. HPA-CCNA, 30 Rockefeller Plaza, New York 20.

MAY 12-14—*New York State Society of Professional Engineers*, 29th annual convention. Hotel Commodore, New York City. The society is at 1941 Grand Central Terminal, New York 17.

MAY 12-13—*Automation-Engineering for Tomorrow*. An engineering symposium presented as part of the Centennial celebration of Michigan State College, East Lansing.

MAY 22-26—*Air Pollution Control Association*, 47th annual meeting. Detroit. Executive secretary: Harry C. Ballman, APCA, 4400 Fifth Ave., Pittsburgh 13.

MAY 23-25—*Oil-Heat Institute of America*, commercial-industrial oil burning and equipment confer-

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Auer Grilles are characterized by outstanding beauty, correctness of design and construction. They are a balanced combination of open area, structural strength and concealment. Auer Ornamental Grilles are available in steel, stainless steel, brass, bronze or aluminum in a large variety of designs and finishes, to fill the most exacting decorating requirements. They are ideal for convector and radiator enclosure fronts, for modernization or new construction.

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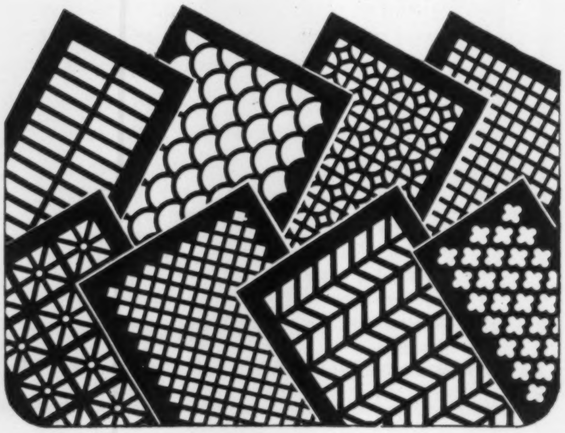

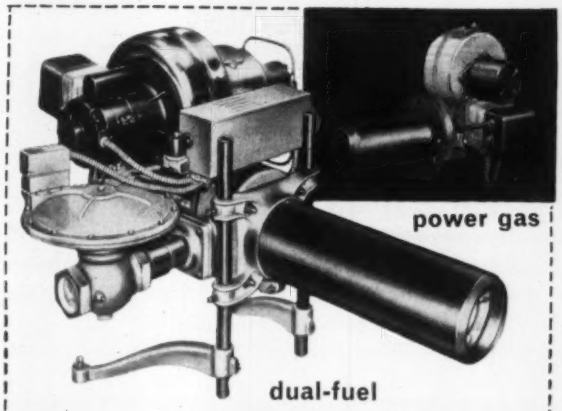

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verified facts show that your processing customers can make terrific savings by burning gas in the off peak season. Here is a letter from the Aurora, Ill., AURORA FURRIERS AND CLEANERS giving concrete figures on what a tremendous saving a Syncro-Flame dual-fuel unit made for them . . . this is on just one unit . . . savings can be proportionately greater when using more than one unit.

boiler, I mentioned that there was a tremendous saving in burning gas in off-peak season. I thought you might be interested in some figures to verify my statement. I am giving you figures for a five month period comparing the cost of gas in 1954 with the cost of oil for the same period the year before.

Oil 1953		Gas 1954	
June	$306.58	June	$115.41
July	260.39	July	105.30
Aug.	232.36	Aug.	105.70
Sept.	312.82	Sept.	121.69
Oct.	299.85	Oct.	123.08
	$1412.00		$571.18

Saving over five month period $840.82

We are very happy with our Syncro-Flame burner and feel that it has almost paid for itself the first year. Also, we want to thank you and Mr. Monroe for

Automatic switching Syncro-Flame Dual-Fuel gas/oil burners burn either gas or oil with completely automatic fuel-air changeover at max. efficiency. Satisfy utility requirements as to gas availability—outside thermostat or remote manual operation. 100,000 to 4,100,000 BTUs/hr. gas—1 to 30 gals./hr. oil . . . The most reliable of all dual-fuels . . . Approved over the entire range of operation by Underwriters' Lab. Send for complete details and spec. sheets.

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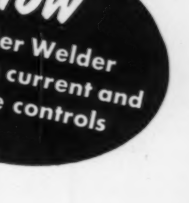

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MEETINGS & CONVENTIONS *Continued*

ence. Kellogg Center, Michigan State College. Registration: Continuing Education Service, Michigan State College, East Lansing.

MAY 23-25—*Hot Water Steam Heating and Air Conditioning Short Course.* Purdue University. The course will be sponsored by The Institute of Boiler and Radiator Manufacturers. For information, write: Merle M. McClure, assistant director, Division of Adult Education, Purdue Univ., West Lafayette, Ind.

MAY 23-26—*National District Heating Association*, 46th annual meeting. Edgewater Beach Hotel, Chicago. John F. Collins, Jr., secretary-treasurer, NDHA, 827 N. Euclid Ave., Pittsburgh.

JUNE 6-9—*National Industrial Service Association, Inc.*, 22nd annual convention. Ten subjects of interest to electric motor, generator and transformer repair shops to be presented. Los Angeles. Registration: Horace Barks, NISA, 818 Olive St., St. Louis 1.

JUNE 7-10—*American Welding Society*, 3rd annual show. Municipal Auditorium, Kansas City, Mo. The annual spring technical meeting is to run concurrently with the show. National secretary: Joseph G. Magrath, at the society, 33 W. 39th St., New York 18.

JUNE 12-15—*American Society of Refrigerating Engineers*, semi-annual meeting. Milwaukee. ASRE headquarters, 40 W. 40th St., New York 18.

JUNE 13-17—*The Pennsylvania State University*, heat transfer short course conducted by the university's College of Engineering and Architecture. Write: General Extension, The Pennsylvania State University, University Park, Pa.

JUNE 19-23—*American Society of Mechanical Engineers*, Diamond Jubilee semi-annual meeting, Boston. Annual meeting is scheduled November 13-18 in Chicago. ASME headquarters, 29 W. 39th St., New York.

JUNE 20-24—*American Society for Engineering Education*, 63rd annual meeting. Hetzel Union Bldg., The Pennsylvania State University. Registration: Professor K. L. Holderman, 103 Mechanical Engineering Bldg., The Pennsylvania State University, University Park, Pa.

JUNE 26-*JULY* 1—*American Society for Testing Materials*, annual meeting. Chalfonte-Haddon Hall, Atlantic City. The society is at 1916 Race St., Philadelphia 3.

JUNE 27-29—*American Society of Heating and Air-Conditioning Engineers, Inc.*, semi-annual meeting.

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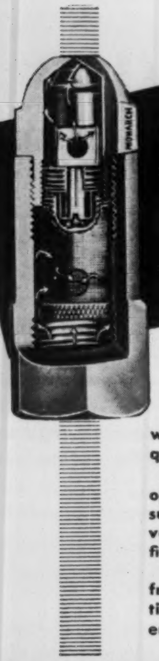

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MEETINGS & CONVENTIONS

Continued

St. Francis Hotel, San Francisco, ASHAE headquarters, 62 Worth St., New York 13.

JULY 12-14—*Western Plant Maintenance Show.* Pan Pacific Auditorium, Los Angeles. Management: Clapp & Poliak, Inc., 341 Madison Ave., New York 17.

NOV. 2-5—*World Symposium on Applied Solar Energy.* Phoenix. The symposium is cosponsored by the Association for Applied Solar Energy and Stanford Research Institute, Stanford, Calif.

NOV. 14-18—*Chicago Exposition of Power & Mechanical Engineering.* Coliseum, Chicago. The exposition is being held in conjunction with the 75th Anniversary Meeting of the American Society of Mechanical Engineers. Management: International Exposition Co., Inc., 480 Lexington Ave., New York 17.

NOV. 28-DEC. 1—*9th Exposition of the Air Conditioning and Refrigeration Industry.* Convention Hall, Atlantic City. The exposition is sponsored by the Air Conditioning and Refrigeration Institute, 1346 Connecticut Ave., N. W., Washington, D. C.

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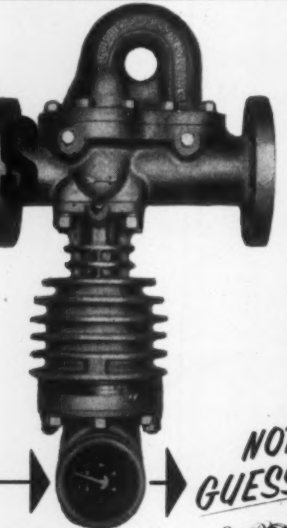

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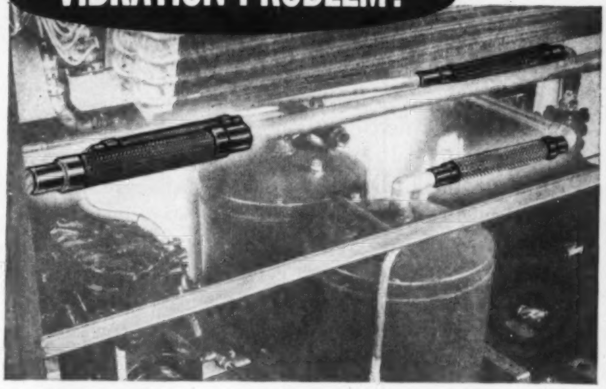

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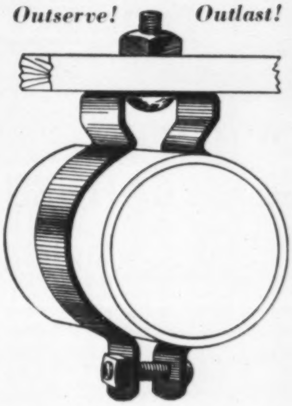

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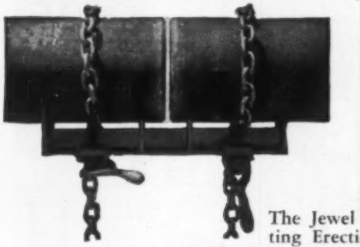

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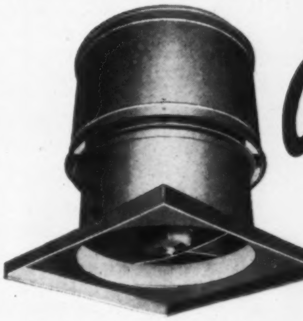

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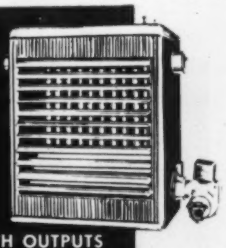

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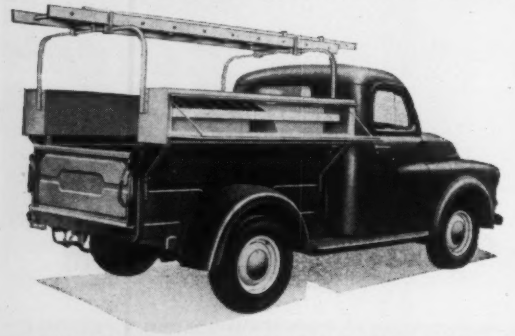

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Recommended Safe Practices for Inert-Gas Metal-Arc Welding—Covering all aspects of safety in this type of welding, it outlines control measures for protecting workers from ultraviolet radiation and metal fumes. American Welding Society, 33 W. 39th St., New York 18. 50c.

The Defense Materials System in Our American Industry—41 pp. Published by U. S. Department of Commerce. Copies from: Superintendent of Documents, U. S. Government Printing Office, Washington 25. 25c.

American Standard Installation of Gas Piping and Gas Appliances in Buildings, Z21.30—2nd Ed.

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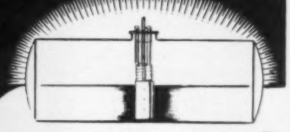

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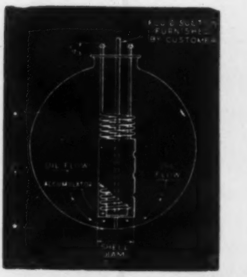

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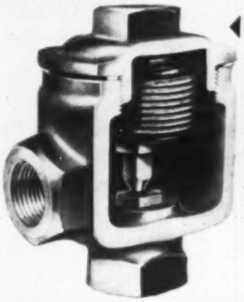

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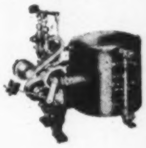

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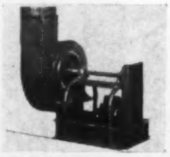

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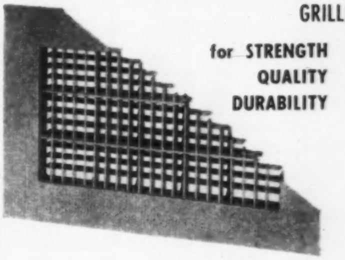

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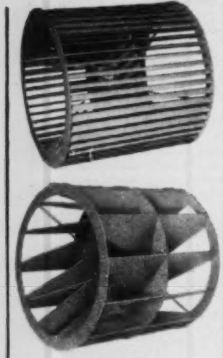

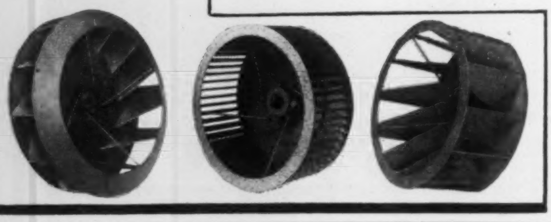

NEW BOOKS & REPORTS

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American Gas Association Laboratories, 1032 E. 62nd St., Cleveland 3. 25c.

THERMODYNAMICS—By Ray L. Sweigert and Mario J. Goglia. 355 pp. The Roland Press Co., 15 E. 26th St., New York 10. $6.50.

1954 SUPPLEMENTS TO BOOK OF ASTM STANDARDS—In 7 parts. Part 1 contains specifications for metal-arc welded steel pipe for transmission service. Part 3 includes standards for thermal insulating materials. American Society for Testing Materials, 1916 Race St., Philadelphia 3. $3.50 per part. $24.50 per set.

INDICES OF HEAT STRESS—By F. E. Smith. Medical Research Council Memorandum No. 29. Her Majesty's Stationery Office, London. Copies from British Information Services, 30 Rockefeller Plaza, New York 20. 50c.

AMERICAN STANDARDS—1955 Ed. Includes standards for pipe and piping. American Standards Association, 70 E. 45th St., New York 17. Free.

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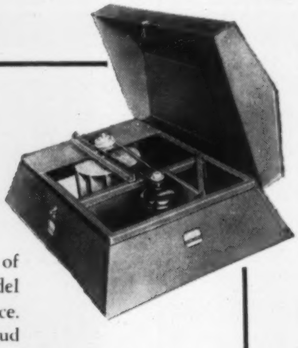

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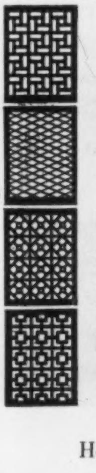

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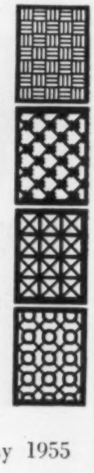

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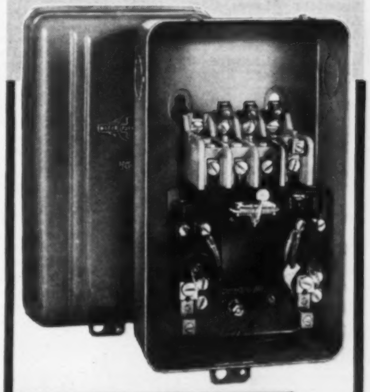

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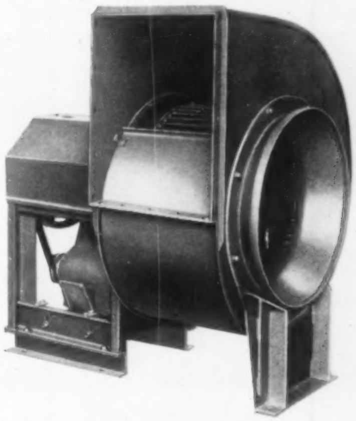

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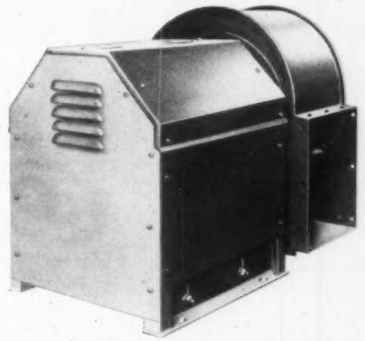

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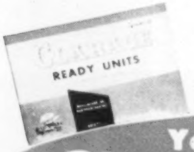

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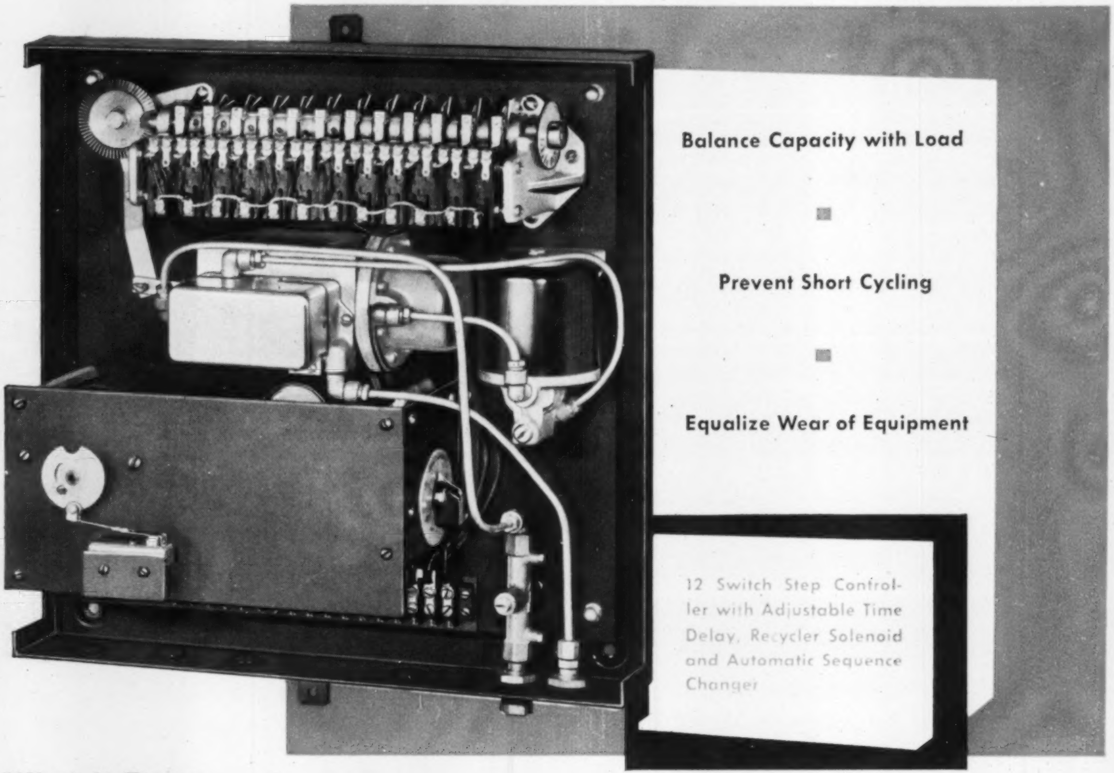
JOHNSON PNEUMATIC STEP CONTROLLER FOR
CAPACITY CONTROL OF REFRIGERATION MACHINES



Balance Capacity with Load

Prevent Short Cycling

Equalize Wear of Equipment

12 Switch Step Controller with Adjustable Time Delay, Recycler Solenoid and Automatic Sequence Changer

What It Does

This new and improved controller is designed to accomplish, with a single compact unit, everything that is desired for the control of multiple step refrigeration installations, including "on" and "off" operation of the steps in sequence, positive prevention of the starting of more than one compressor at a time after night shutdown or after current failure, and manual or automatic changing of compressor operating sequence to equalize wear. It can be used to control one or a group of refrigeration machines. It completely eliminates all the disadvantages of a series of separate pressure switches.

How It Works

The Johnson Pneumatic Step Controller, responding to changes in control pressure from a Johnson Pneumatic Thermostat or other regulator, actuates a number of separately adjustable, snap-acting, single-pole, double-throw switches in any desired sequence. Control arrangements include (1) starting and stopping two or more compressors in sequence, (2) operation of cylinder unloaders in sequence, or (3) a combination of (1) and (2).

Special Features

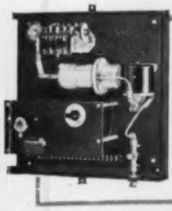
Recycler and Time Delay—Recycler Solenoid immediately returns all switches to their normal position on shutdown or current failure. Time Delay assures the proper interval between successive switch operations on start-up or when current is restored after failure.

Sequence Changer—Varies the starting sequence of compressors to equalize running time and wear. Step Controllers are furnished with either Manual or Automatic Sequence Changer.

Models—Choice of 4, 6, 8 and 12 switch units, with or without special features such as Recycler, Adjustable Time Delay and Sequence Changer.

* * *

Installation and operation of the Johnson Pneumatic Step Controller is both simple and inexpensive. A nearby Johnson engineer will gladly explain, without obligation, how it can best solve your special problems, or write today for full details.



OTHER APPLICATIONS

Johnson Step Controllers are also used to control multiple fan or pump installations, electric heaters and other systems where electrically actuated devices are to be operated in sequence from a proportional acting pneumatic controller. Send the coupon for more facts.

JOHNSON CONTROL

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Please send me Apparatus Bulletin G-180 describing specifications, features and application of Johnson Pneumatic Step Controllers.

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